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TURIN ELECTRICAL CONGRESS.

THE Associazione Elettrotecnica Italiana is at present engaged in the organisation of an International Electrical Congress, to be held in Turin from September 11th to 16th next. The Comité d'Honneur is under the distinguished patronage of His Royal Highness the Duke of Abruzzi, and includes as members Prof. Elihu Thomson and Col. R. E. Crompton, C.B., the President and Honorary Secretary respectively, of the Electrotechnical Commission.

In order to ensure that, from an international point of view, the Congress shall be as representative as possible, a Committee of Organisation has been formed under the chairmanship of Prof. Luigi Lombardi, the able President of the Italian Society, who is also President of the Italian Electrotechnical Committee. The members of this organising committee consist of a certain number of Italian gentlemen, together with the Presidents of the Electrotechnical Committees now established in 16 different countries, and, in those countries in which an Electrotechnical Committee is not yet nominated, the presidents of the electrical societies or old-established engineering associations which deal with electrical matters.

The various members of this Committee are to suggest a list of names of those who may be asked to read papers upon one or other of the subjects arranged to be discussed at the Congress. Papers may also be submitted to the secretary by a member of an electrical society in any country, and, if accepted, will be duly printed prior to the opening of the Congress. The papers are to be presented in French, or in English, German or Italian when accompanied by a French translation or *résumé*. The subscription has been fixed at 20s., which entitles the member to take part in all the discussions of the various sections and to receive a copy of the *Transactions* of the Congress. The languages mentioned above will also be permitted in the discussions. The visits of interest and the excursions to the Italian lakes will be shared in by the members of the Congress and by the delegates to the Electrotechnical Commission, the meetings of which will be held concurrently with the Congress.

The above constitutes the preliminary information available in regard to the Congress, and it is evident that our Italian friends are doing their utmost to ensure a really international gathering, both in point of attendance and of actual papers to be read. The papers are to be essentially practical, in order that they may form the bases of discussions of the widest character.

The attraction of the Exhibition, to which we intend to refer shortly, and the fact that Turin is situated amid some of the most charming scenery in Europe, besides being easy of access, to say nothing of its being the holiday season, should certainly guarantee a full attendance.

A large number of French and German electricians intend taking active part in the Congress, and it is sincerely to be hoped that we in England will rise to the occasion and prove that British electrical engineers not only take cognisance of, but are also keenly interested in, the progress of the electrical industry beyond their own shores. The Institution of Electrical Engineers will, no doubt, appoint official delegates in the same manner as the American Institute contemplates doing, but we would urge electrical engineers and manufacturers alike, personally to take steps to support the Congress and thus further the efforts of the Italians towards

making the assembly a notable success. There cannot be the slightest doubt that those who make up their minds to go to Turin will be amply repaid for the time and money expended. They will not only meet many old friends, but will certainly make new ones, and, now that the industry is beginning to realise the importance of foreign markets, such a grand opportunity of coming into close and friendly touch with our foreign *confrères* will certainly appeal to everyone who has at heart the welfare and expansion of the industry.

As a gathering of the world's electricians, the Turin Congress is bound to be an event of the highest importance. Moreover, the very extensive organisation of the Electrotechnical Commission now makes it possible to arouse interest amongst influential men of all countries, and there is reason to hope that representatives from outlying nations, including several of the Latin-American Republics, may be present.

Should questions arise during the Congress upon which international agreement seems possible and desirable, the Electrotechnical Commission, being the permanent body, will be requested to undertake their detailed study with a view to international solution. The promotion of such a large gathering, really international in character as well as in name, is a task of no mean order, and we feel sure it will meet with the support it undoubtedly merits, and that its success will reflect the highest credit upon the Italian electrical engineers.

In proportion as the electricians of the various nations become more generally acquainted, and better understand each others' merits and methods, will the development of international trade be fostered, and every movement which tends towards this happy achievement is bound to receive the cordial support of the electrical industry in every country.

The Impregnation of Insulating Materials.

Between the dictionary definition of a word, which is exact and scientific, and its every-day application, which is often loose and inexact, a wide margin may be said to exist. Leaving for the moment the exactitude of the dictionary, the average electrical engineer, if pressed for an abstract definition of what was understood by impregnation, would suggest the filling of the interstices of any solid substance in a manner akin to the phenomenon of saturation as exhibited in the atmosphere or in the case of the aqueous solution of an acid or a salt. If pressed further as to how far his abstract definition held good in the workshops, he would have to admit a considerable discrepancy between the abstract definition and its practical application. He would point out that this discrepancy was common also to railway engineering practice in regard to the impregnation of railway sleepers with creosote or allied substances, save for the fact that the absorption of a certain minimum weight is invariably specified.

In its most slip-shod application, impregnation is sometimes held by the electrical manufacturer to apply to a coating applied either by dipping or by the use of a brush. Such a method of treatment gives only a superficial coating, and it would be as logical to describe the structural steel work of a central station as impregnated with paint as to apply this term to a length of double cotton-covered wire passed through a bath of varnish or to a piece of fibrous insulating material varnished with brush. Such superficial coatings serve, unless the material is heated to drive off a portion of the imprisoned air, to seal up within the interstices of the material appreciable quantities of moisture. They are, moreover, liable to abrasion or puncture, while in the case of woven fabrics, projecting fibres act as ducts for the ingress and egress of moisture.

Where less viscous fluids than varnish are used, as in the case of the resin oils used for paper-insulated cables, impregnation from a heated bath exposed to the atmosphere is in general very ineffective. An examination of a section of such paper under the microscope shows distinctive areas containing varying quantities of the impregnating medium. This, of course, is due to the occurrence of a species of dialysis, whereby the pores in the outer areas clog just as a filter clogs, the thinner constituents penetrating further into the material. It is also the fact that a similar phenomenon takes place in those cases where untreated papers are wound on the cores of the conductors, and the whole is then impregnated in vacuo. The inner layers are, as a rule, less absoptive than the outer layers, while any single wrapping is found to be not uniform in its absorption at different depths. In any case it is manifest that impregnation in the sense of saturation does not exist, and can hardly be expected to exist, in the case of insulating materials.

Impregnation in vacuo as applied to field coils, or former-wound coils for armatures, may be regarded as a fairly satisfactory application of a word, which it is an abuse of the English tongue to apply to any ordinary dipping or brushing process.

Absolute impregnation, which is akin to saturation, must be regarded as a conception akin to efficiencies of exactly 100 per cent. As a practical term the impregnation of materials for electrical use should be held to cover a definite degree of absorption. Thus, for materials of the cellulose group, a certain increase in weight should be requisite. With bulkier articles, such as wood troughing for cables laid on a solid system, either a defined increase in weight, or a defined ratio of discoloured area to the area uncoloured should be specified. The fixing of suitable minimum limits might, in both cases, well receive the attention of those sub-committees of the British Engineering Standards Committee, whose attention is specially directed to insulating materials.

The Price of Electricity.

The report of Mr. Cowan's paper on "The Price of Electricity," read before the British Association at Sheffield on September 1st, has now been issued, and is, with an additional note by the author, and an imperfect synopsis of the discussion, available for general perusal.

We dealt very fully, in our issue of September 9th, 1910, with the paper and the discussion. The author's note is the only part of the pamphlet before us which has not already received attention. In so far as it amplifies the paper, it is welcome, and for Mr. Cowan's admission of some lack of lucidity we are grateful.

Certainly electrical engineers are in need of information upon economics, from the standpoint of the professed economist. In too many cases engineers suffer from lack of training for the work which they are called upon to do. The central-station engineer of to-day must needs be the most versatile being in the universe. He is trained at college for an electrical career, and after some works experience he knows all about engines, generators, mains, transformers, lamps, motors, cables and accessories. So much may reasonably be expected of him, for that was what he intended to learn about. But when he gets into the managerial chair, or even into the staff immediately about the chair, he must add to his engineering capabilities some knowledge of accountancy, of general law, of municipal law, of correspondence, of publicity and business-getting, and, not least, of that science known as political economy. Is it not easily understood that there are many men who are really unable to do all this? And it is impossible to get over the difficulty by appointing a huge and expert staff to deal with each item separately. A manager must understand quite a lot about all of them, or there will be lack of coherence in the policy of the undertaking. We know very well that it is not the business of the left hand to know what the right hand is doing; but it is the business of the head to watch them both, and to watch them intelligently.

The engineering mind is an adaptable mind. All great engineers are great men, and great men are only great to the extent that their minds are engineering minds. They must perceive the bearing that forces have on one another, and they must be able to see what the resultant is likely to be. Statesmen, churchmen, financiers, traders, or whatever they may be, except they can do this they are useless, and will not succeed.

Most engineers, in spite of manifold discouragements from committees who do not know and will not learn anything of their undertaking, in spite of cut salaries, in spite—sometimes—of breakdown in health, have adapted themselves admirably to the requirements of their positions. It will be found that a company of electrical engineers, especially if engaged in the production, upon a large scale, of cheap articles, whether units or accessories, will be able to understand and to appreciate the problems of modern life in every department in a very complete manner.

Therefore, although we welcomed Mr. Cowan's paper, and although we welcome his note, we are rather inclined to think that he is barking up the wrong tree. Between the upper limit of "what the traffic will bear," and the lower limit of "what the undertaking can bear," the price of electricity should be a flexible quantity. Where we think Mr. Cowan makes his mistake is in supposing that nobody knows this but himself. The price of electricity not only should be, but actually *is*, a flexible quantity.

Mr. Cowan has circulated copies of the paper among his fellow engineers, and invites "criticisms of the theory put forward, or comments upon practical difficulties in applying it." Up to the present we do not remember to have seen anything of the kind, and we think it is for the reason suggested above, that the importance of the subject, upon which he rightly lays stress, has not been so generally overlooked as he imagines.

Corrosion.

It is to be hoped that Admiral Corner's contribution to the *Proceedings* of the Institute of Metals may serve as an incentive to others, who have opportunities of observing the action of corrosion on metal surfaces, to place on record examples which come under their notice. Although, as may be gathered from the paper, cases of corrosion of ships' plates are rare, the precise causes are so ill-defined that the collection of data on the subject will always be of value.

The paper gives one instance of corrosion which went so far as to cause serious leakage—that of the *Megaera*, in 1869, which, owing to action between a copper strainer and the iron plates, ultimately had to be beached to prevent her sinking. The remaining instances given are concerned with corrosion of internal parts, which may, of course, be of great importance where steam pipes or condensers are concerned, though not so immediate a cause of danger as in the case of plates or structural work.

The electrician is principally concerned with the question of the ship's wiring, as it is evident that the use of the structure in any degree as a common return is undesirable, and probably contributed in the past to prejudice shipbuilders against the use of electricity. At the present time, however, when systems of continuously protected leads can be trusted to take care that defects in insulation shall give early notice of their existence, corrosion (excluding ordinary oxidation or rusting), where it exists, must be due to electrochemical action. In dealing with the vast quantities of metal which constitute a modern ship, it is hardly possible that the relative position of every dissimilar piece of metal which may possibly be reached by an electrolyte can be determined except by practical observation, and therefore any account of actual occurrences is welcome as an assistance to locating positions in which there is a likelihood of corrosion taking place.

Coal Mine Explosions.

There seems so little reason to doubt that the worst colliery explosions are due to dust rather than to gas, that electrical engineers should welcome anything that will minimise the danger of the fiery mine.

Gas is often very local in its occurrence. A spark may fire it and no mischief may result in a wet mine, but in a dusty mine a small explosion may raise a dust-cloud, and may fire that cloud, and the explosion then extends with many times the intensity of effect. It is very difficult to wet coal dust, and the use of sprinkling pipes often means that the water just runs off the dust and does not wet it, though it wets the mine generally and promotes the welfare of that parasitic worm which produces ankylostomiasis. Any wetness is thus dangerous from this point of view.

But Dr. Thornton has lately discovered that soapy water will instantly wet coal dust and soak its way into it up to the full extent. Moreover, when the water has dried out the dust does not again become dust, for the soap remains disseminated throughout the mass and the dust has become a more or less cloggy mass, and is as effectively laid as is the dust of a country road by tar or oil. Experiments have been made which so far are said to show that the treatment of a dusty mine will be both effective and cheap, and there is not likely to be any offensive result from the use of soap, for if necessary the water can be made a vehicle for some form of antiseptic which will go far to improve the general sanitation of a mine.

We understand that the matter is receiving the attention of colliery managers in Durham, and that more will be heard of it.

The successful treatment of dusty mines would certainly reduce the worst horrors of the mine explosion, and would prevent the firing of a little gas from expanding into a huge disaster.

German Capital Expansion in South America.

A new issue of capital is in contemplation by the German Transmarine Electricity Co., of Berlin, which is principally interested in lighting and tramway undertakings in South America, and whose various emissions of capital from time to time have been recorded in this journal. The new proposal is to increase the ordinary share capital by £500,000 to £5,000,000, and to make a further issue of bonds amounting to £750,000, raising the bond capital to £4,250,000 and the two classes combined to £9,250,000. All this expansion has taken place within the comparatively short period of 12 years, or since the company was formed in 1898 with a share capital of £500,000. It was known that the previous emission of capital in 1910 would be inadequate for the company's purposes, and at the general meeting last June it was intimated that further resources would probably be raised by means of bonds. Since that time it has been reported that the Transmarine Co. has been promoting new schemes of extension in Buenos Ayres and other South American localities which would necessitate a large issue of capital. It is not known what these projects really are at the present time, although it is assumed that the information will be furnished at the forthcoming meeting of the company.

Exports and Imports, 1910, and Preceding Years.

Elsewhere in this issue, we publish our usual monthly statement of exports and imports of electrical goods during the previous month, together with a series of curves, which indicate more clearly than the monthly returns, on which they are based, the course of our electrical business in the leading markets of the world during the last few years.

We believe that in no other direction are reliable classified statistics of electrical business regularly published. The lump-sum figures which appear from time to time in the news columns of the daily Press and elsewhere offer no indication as to the value of any particular market, or as to the peculiar trade requirements of the latter.

This very necessary information is to a large extent only obtainable from our regularly published returns, and this has, we believe, been fully appreciated by many electrical firms in this country.

The principal curves, which summarise the data of several years past, will, no doubt, be studied with considerable satisfaction, and will, we trust, help to stimulate the interest of those engaged in trade overseas.

A TWO-PHASE COMPLICATION.

By ARTHUR T. BULLEN.

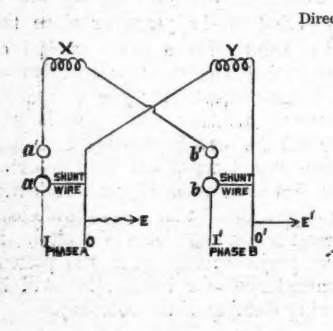
SINGULAR occurrences are by no means uncommon on alternating-current circuits, and it is probable that a two-phase supply suffers more than any other in this respect. It is almost inconceivable that more complications than those described here could possibly exist in any one circuit.

The supply system under consideration is a two-phase, four-wire, with 200 volts between the outer and inner wires. There is usually an earth of greater or less resistance on each outer, which does not vary to any great extent from time to time; but it is not entirely unknown that one outer shall be only relatively slightly earthed on one day and dead earthed the next.

Some time ago there was connected to the circuit a 75-B.H.P. two-phase B.T.-H. motor, its consumption being measured by two single-phase Westinghouse meters with current transformers; the average monthly consumption was roughly 1,000 units on each phase.

For some unknown cause the motor developed a serious fault, and had to be partially rewound. Owing to considerations of time, the rewinding was entrusted to a local firm, and unfortunately resulted in the wires to the terminals becoming crossed inside the motor. The machine was then reconnected to the mains, the leads, which had been carefully marked on disconnecting, being replaced in the same terminals. The net result of this was that one winding was connected across the two inners and the other across the two outers (see fig. 1).

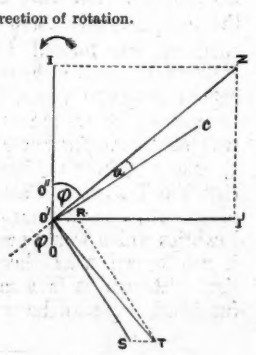
Under ordinary conditions it would have been impossible to start the motor at all, but owing to a peculiarity in "earths" described later, it was found that the motor would start, although very slowly. It continued to run under these conditions for a considerable period with a current, measured by an ammeter in one winding, about 20 per cent. in excess of the current when correctly connected. The



Motor connections.

FIG. 1.

Direction of rotation.



Phase connections.

FIG. 2.

results as indicated by the company's meters were rather perplexing, since one meter commenced to run backwards at about one-quarter the speed of the other, or to be more precise, the registration on one meter was 2,400 per month, as against 600 in the reverse direction on the other. While investigations were going on to account for this unseemly behaviour on the part of the meters, a fresh development suddenly occurred, the motor one day refusing to start. It was then that its freakish behaviour was formally explained, a test on the motor revealing its wrong connections.

The precise reactions that were taking place are most difficult to trace, but the following explanation seems most to fall in with the known facts:—

X and Y represent the two windings of the motor; I O and I' O' are the inners and outers of phases A and B respectively of the company's supply; *a* and *b* are the meters on phases A and B respectively, the current transformers being omitted for the sake of clearness; *a'* and *b'* are the ammeters on the same circuits. The motor connections are as shown. E and E' are partial and dead earths respectively on the outers of phases A and B.

The difference of potential under these conditions across the inners is rather less than 283, and across the outer an unknown quantity, *x*, which was just sufficient to produce a dull glow on the 200-volt lamp tapped across. The phase angle between these two voltages is much less than the phase difference would have been had the motor been correctly connected, hence the poor starting torque (see fig. 2).

By vectors, O' Z represents, in phase and magnitude, the voltage across the inners, less than 283 since O' I is a voltage less than 200. O O', the voltage across the outers, has a phase difference from O' Z represented by the angle ϕ. O' R and O' S are the fluxes created by these voltages, resulting in a rotating field represented in magnitude by O' T. It is now clear that, under the conditions defined above, motion will take place, the motor running in the correct direction.

The alteration in conditions can only be explained by the partial earth becoming a dead earth and thus destroying all difference of potential between the outers of the two phases. Since no rotating field now results, the motor refuses to start. A test on the outers after stoppage showed definitely two dead earths.

The general effects having now been discussed, it becomes a more complicated matter to go into the case of the registration of the energy consumption by the meters.

First, it is obvious from fig. 1 that the main coils of both meters are in the same circuit, and consequently, at first glance, it appears that they will register the same amount, but this is not so, since the shunt coil of each meter is across a separate and distinct phase.

Moreover, neither of these voltages is actually in phase with the voltage across the motor; but that the registration of one meter will be practically correct, if the voltage across the outers is small, will be clearly shown by reference to the diagram.

The voltage O' Z can be resolved into two voltages, O' I in phase with phase A, and O' I' at right-angles to it. Now, if the current lags by angle α behind O' Z, then the working watts are $V C \cos(\phi + \alpha) = O'I \times C \cos(\phi + \alpha)$, which are but little less than the watts recorded on the meter, the difference being represented by the voltage $O O' \times C \cos(\phi + \alpha)$. The next point is in respect of the amount to be charged for the other phase of the motor. It is obvious that the amount will not be the same as that consumed in the winding across the inners, and as no meters or instruments were in that circuit, it is impossible to estimate it. Strictly speaking, it is within the rights of the supply company to charge an amount equal to that payable for the other circuit, but this certainly would not be fair to the consumer. It would also be unfair to the company, if they were content to charge a total amount equal to the amount payable when the motor was connected correctly, since a motor wrongly connected is certainly less efficient than when working correctly.

It is, however, useless to attempt to carry on this discussion further, owing to lack of information, but had sufficient data been at hand, it is certain that many more interesting features could have been presented.

One most important item suggests itself, and manufacturers of electric motors would do well to take a hint from the curious happenings detailed in this article. It is the general rule to find the terminals of motors marked simply 1, 2, 3, 4. This is not good practice; it would simplify matters and prevent recurrences of the above mistakes if they could be marked A_1, A_2, B_1, B_2. It would be no more trouble for the makers, and would save an enormous amount of anxiety and inconvenience to those who are entrusted with the fixing of motors.

German Local Authorities and Manufacturers.—The sub-prefects in Prussia, or heads of the local Government districts, met recently in Berlin to discuss the question as to the advisability of providing an electricity information bureau, in order to be independent of the contracting firms in connection with the establishment and operation of electricity works. The opinion was expressed that an advisory bureau would have a beneficial effect. It is now intended to form a so-called advisory association, bearing the name of "Electricity," which is to impart information in all such cases, and the expenses are to be defrayed by the local government districts in Prussia.

A NEW FEATURE IN PLANING-MACHINE CONTROL.

SOME time ago we were able to describe in detail the "Lancashire" system of electric drive for planing machines introduced by the Lancashire Dynamo and Motor Co., Ltd., of Manchester, and it is interesting to note that the advantages which we then described have been so well appreciated by owners of machine-shop equipments that the system has been adopted to a very consider-

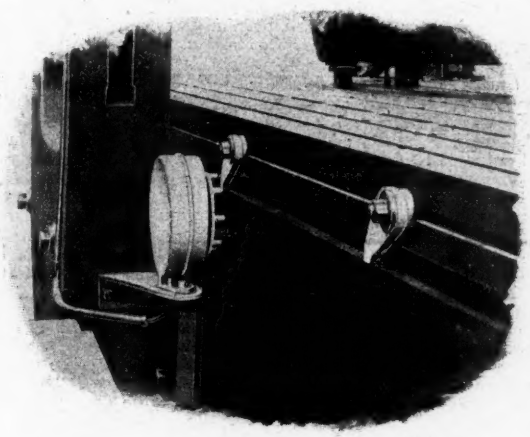


FIG. 1.

able extent. Our purpose in referring again to the matter is to draw attention to a recent improvement, which constitutes an entirely novel departure in the electrical control of planing machines, and opens out possibilities in the direction of the speeding-up of machine-shop production which no manufacturer can afford to neglect.

It will be remembered that one of the advantages of the system already described in our columns is that the return speeds obtained are higher than have been possible with other systems, and the time lost at each reversal is less. By a simple and inexpensive

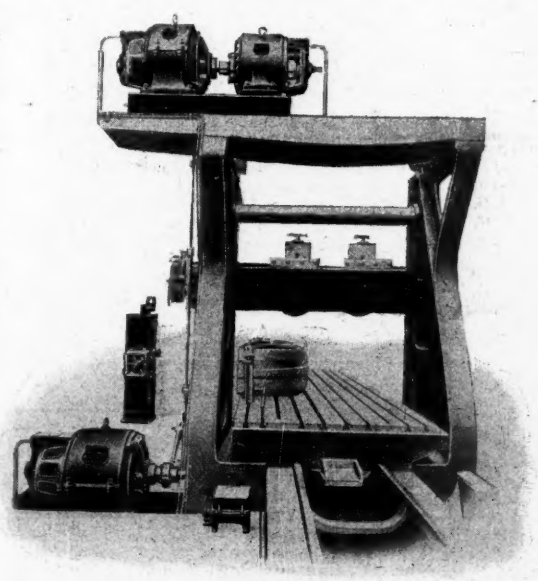


FIG. 2

attachment the table can now be speeded up to the full return speed during those portions of the stroke when the tool is not actually cutting, and at the same time the control is so perfect that the tool starts to cut again at the proper speed of cutting. Moreover, the table may be speeded up when the tool has entered the metal to twice the ordinary planing speeds, and the speed reduced again before the tool leaves the metal.

This accelerating device is in the form of a small switch, which is worked by adjustable stops on the planer table. This is shown in fig. 1. On the cutting stroke, each of the stops on the table edge moves the switch through an angle of 45°. This has the effect of alternately accelerating and retarding the planer motor. On the return stroke, as the stops are of the swivel type, they glide over the switch without causing any movement, thus making no alteration in the return speed. To facilitate simplicity of adjustment, it is advisable to fix the accelerating device on the opposite side of the tables to that on which the reversing dogs are placed. If this is found impossible, however, a similar arrangement can be effected, using the existing table slot.

The value of the first function mentioned above, that of the speeding up between cuts on the cutting stroke when two or more surfaces are some distance apart, such as occur when motor frames, as shown in fig. 2, are being planed, is shown as follows:—Some tests were made on a 6 ft. × 6 ft. × 18 ft. planing machine, and the time taken over a period of five cycles, or complete backward and forward motions of the table, was observed on identical pieces of work with and without the accelerating device. The first test was on some bed-plate facings, requiring one speeding up, which, with the accelerating device, took 55 seconds. Without the device the time taken was 85 seconds for the five cycles, so that a saving of time of 35 per cent. was effected. Another test was made in planing a two-motor frame, where two speedings-up took place. Without the accelerator, five cuts and return strokes took 150 seconds, while with it the time was only 85 seconds—a saving of 43 per cent. The value of the device is therefore obvious.

The second function is, perhaps, still more important. The limiting speed in planing work is not, at present, the maximum cutting speed which a tool can stand, as in a lathe (where the work throughout a long cut is constant), but is the speed at which the tool will stand the shock of the first impact with its work. The energy of a shock in a planer is enormous, as the stored energy of the work, the table, and the driving mechanism will not permit of the slightest easing-down to accommodate the tool on the ordinary planer. Hence the whole cut has to be performed at a speed corresponding to that at which the tool can stand its shock. With the accelerating device, however, the table can be speeded up when the tool has entered the work, and much time is economised on a long cut. Another point is that when a cut is being taken in material which is not of a highly fibrous and tenacious structure—as, for example, when cast-iron is being planed—there is a tendency, if the tool is being brought through the metal at a high speed, for it to break a portion of the metal away at the finishing edge of the cut. This may render the work valueless, and in order to avoid this, and still retain the advantages of a high cutting-speed in the bulk of the material, the device can slow-down the table just before the end of the cut.

It is therefore apparent that a species of control of planing machines has been evolved in this simple device which has never before been obtained on any system, and for this reason it merits careful attention.

PROCEEDINGS OF INSTITUTIONS.

Notes on Everyday Uses of Electricity.

By W. W. LACKIE.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS, *at Glasgow, January 10th*, 1911.)

A GENERAL supply of electrical energy is now available in almost every city and town having a population of over 12,000 inhabitants, as well as in many country districts. The use of electrical energy for lighting and for power is quite common, but for heating and cooking it is only now being seriously considered.

Lighting, ventilating and heating are inter-dependent, and must be considered in their relation to each other, as the amount of ventilating and heating necessary will, in certain circumstances, depend upon the method of lighting.

For many reasons I advocate the use of electricity for lighting purposes. The principal reason, however, is that, as electric light neither vitiates, exhausts, nor raises the temperature of the atmosphere, it reduces the need for ventilation. With electricity at 3d. per unit and gas at 2s. per 1,000 cb. ft., incandescent gas is about equal in price to electricity with the metal-filament lamp.

I.—VENTILATION.

In an ordinary living room, occupied by a number of persons proportionate to its size, ventilation is said to be efficient if the air is changed four times an hour. In the chimney leading from a coal fire in a room of 2,000 cb. ft. capacity, it is found that the products of combustion pass up the chimney into the atmosphere at the rate of 330 cb. ft. per minute. It is said that the air is thus renewed at the rate of 10 times per hour. Similarly, where a gas fire is used instead of a coal fire, tests show that the products of combustion in the ordinary chimney pass up at the rate of 166 cb. ft. per minute, and it has been deduced that in such a room the air is renewed four times an hour, or the proper number of times. It is well known that heated air rises naturally to the ceiling, and I am quite certain that the air within 12 in. of the ceiling is not renewed once an hour in the two cases just mentioned. If one ascends a ladder to hang a picture in a room where a gas flame of any kind has been burning for a few hours, the high temperature of the upper air is at once realised. The probability is that the lower strata of the air are renewed 60 times per hour, the air 3 ft. up 20 times per hour, and 6 ft. up twice an hour. The idea that a room can be ventilated by drawing off the air at a height of 18 in. or 2 ft. from the floor, is, to my mind, quite wrong; the air circulation, set up by a coal or gas fire, induces a draught across the

floor which chills the lower air. In a room where there is a large fire burning, it is quite a common thing to hear people complaining of cold feet.

The ideal method of ventilation is to draw off the vitiated air at or near the ceiling. Moreover, as ventilation is more urgently needed at those periods of the year when artificial heat is unnecessary, it seems wrong that ventilation should be dependent upon either a coal or a gas fire. Heat may be required when light is unnecessary, and light may be required when artificial heat is superfluous. Ventilation is always required, irrespective of the presence of either heat or light from an artificial source.

To ventilate a room by placing any form of artificial heat, luminous or otherwise, near the ceiling is also wrong. It is much more expensive than a fan or other device specially constructed to move air by mechanical propulsion.

All the best modern systems of heating tend to dispense with the chimney, and the abolition of the chimney will of course render the fireplace unnecessary. People no longer sit round a fire at night and pass the time, as they used to do, with conversation.

For effective ventilation, one air duct to admit fresh air and another to exhaust foul air (the latter placed near the ceiling) would be much more effective than the present fireplace. I advocate the use of fans or blowers for introducing fresh air on the one side and expelling the foul air on the other. Proper air inlets should be provided. In a room of 20 ft. × 20 ft. × 12 ft., containing 4,800 cb. ft., the lighting necessary is equivalent to 128 C.P. Under ordinary circumstances each person requires 45 cb. ft. of fresh air per minute, so that if four persons were in such a room during the hours of daylight the air would require to be renewed 2¼ times per hour. Every cubic foot of gas burned requires 23 cb. ft. of air per minute, so that if the room were lit with gas the air would require to be changed 2¼ times, due to vitiation by respiration from the occupants, and three times due to vitiation by the gas, or 5¼ times altogether. If electric light were used the air would require to be renewed 2¼ times only. Electric lighting and heating minimise the need for ventilation, because electricity neither depletes the atmosphere nor throws off fumes. The need for fresh air from outside is thus reduced to at least one-half, and the amount of heat required to warm the air inside the room is correspondingly less.

It is claimed by gas enthusiasts that a gas jet ventilates the room just as well in proportion as a gas fire does. A slight consideration of this statement will show how wide it is off the truth. Hot air rises to the ceiling; it is cooled there and falls again, to be again heated, and so on; but the gas jet does not affect the lower air in the room—and it is the lower air nearest the floor-level that most needs renewal.

II.—HEATING.

It has been shown by experiment that 90 per cent. of the energy of coal passes up the chimney, and only the remaining 10 per cent. is effectively utilised for heating. This means that any form of energy which is wholly turned into heat will cost the same as coal, even when the charge per heat unit is nine times the amount asked for the less efficient form of heating. Taking coal at 20s. per ton we get 100,000 B.TH.U. for 1d. Ten per cent. of this is used as heat, so we get only 10,000 heat units for 1d. A Board of Trade unit of electrical energy contains 3,440 B.TH.U., so that to be the same price as coal, electricity would require to be sold at 0·34d. per unit. But I have shown that where electricity is used for lighting, less than one-half of the heating is sufficient, owing to the decreased necessity for ventilation or air renewal. Therefore electricity used for heating would at 0·68d. per unit be equivalent in price to coal at 20s. per ton. If the heat can be controlled and directed to any definitely limited area where it is required, the comparative price of electricity will be still less favourable to coal. Electricity at 1d. per unit for heating should compare favourably with gas.

A fresh application of heating by electricity was carried out recently in connection with a function in the City Chambers. This consisted of heating 3,400 dinner-plates to a temperature of 130° F. To heat them in this way the 3,400 plates required 6,000 watts for 12 hours, or 72 units. Roughly, this meant 1 unit for every 50 plates heated.

In the sick room, in cases of high fever the conditions necessary to speedy recovery are an even atmospheric temperature of about 65° F., the absence of nervous disturbance from noise of any kind, and the maximum of purity in the air breathed by the patient. The electric radiator alone, I believe, shows the qualifications necessary to fulfil these conditions. A gentleman, seriously ill, whose temperature was 104° F., was ordered by his doctor to be kept in an unvarying atmospheric temperature of 65° F.; with an electric radiator this was perfectly done, night and day, for over a week, owing to the ease with which the electric radiator could be controlled to meet natural fluctuations in atmospheric temperature. Apart from the even temperature of the room, the absence of need for noise or disturbance of any kind was particularly appreciated by the nurses. They testified that the electric radiator in this particular case greatly facilitated their work.

At the recent Smoke Abatement Exhibition held in Glasgow, the electricity department of this city erected a four-room and kitchen house, with laundry and bathroom. The air for this house was drawn by an electric fan direct from the atmosphere outside the exhibition building, and was circulated throughout the various apartments. In this way, although the house was contained within the exhibition building, it had an independent supply of pure air unaffected by the air in the general exhibition building, and vitiated only by the attendants and visitors within the electric house itself. The electric house was crowded daily, ironing was being done most of the time, cooking sufficient for 12 persons was carried out, and the atmosphere remained free from objectionable odours. The amount of electricity used in the cooking operations was accurately recorded. As a rule a joint or roast of about 9 lb., together with potatoes and pudding, was provided. The general rule for roasting is 14 minutes per pound of meat to be cooked, so that in the case of a 9-lb. roast, 2 hours 6 minutes would be the right time to give. Seven different types of stoves were used to do this work on different days, and it was found that the time taken to cook a roast of this size varied from 1 hour 45 minutes to 3 hours, and the consumption of energy was from 3 to 7·8 units. The average was 5·4 units, and 2 hours 13 minutes the average total time. The weight of meat cooked, per Board of Trade unit consumed, was 1¾ lb. The difference in the efficiency of electric ovens is therefore still considerable. Four 7-oz. steaks were cooked in 14 minutes with a consumpt of 0·35 unit. This means that 1 unit would do 12 7-oz. steaks or chops in 14 minutes. The heat required for potatoes and puddings was negligible, as they were done at the same time as the roasting. Other data are given below.

A great feature in electric cooking is the reliability of the apparatus. Any operation can be repeated with the assurance that the heat gauged and found satisfactory for the first operation will remain stable for subsequent processes of the same kind: if it takes one minute to toast a slice of bread, the number of slices that may be toasted in 15 minutes is easily ascertained. A joint may be left unwatched, as the process of cooking with the electric oven goes on in a steady, equable way, and the desired result is obtained within a given time. We had one oven equipped with a thermometer outside, a light inside, and two small windows in the oven door. By switching on the inside light with an outside switch, the various stages of roasting or baking were observed without touching the hot oven at all. If it were desirable to move a roast, &c., in the oven, it would be easy to design a simple method of doing this without opening the oven door or touching any of the hot ironwork of the oven. Besides having the thermometer scale marked in the usual way, it might have the words "Roasting," "Baking," &c., shown at the proper places, according to the amount of heat required.

These figures have to be compared with the cost of gas roasting. One test of gas roasting was as follows: 7 lb. roast, potatoes and pudding, 100 cb. ft. of gas, which, at 2s. per 1,000 cb. ft., represents a cost of 2½d.

Kettle	1,000 watts	Self-contained	Boils 1 pint of water in 4 min.
Kettle	800 watts	Ordinary on hot-plate	Boils 1 pint of water in 10 min.
Grill	800 watts	"Tricity"	6 min. to heat from cold, then 6 min. to cook steaks.
Toaster	450 watts	Self-contained	3 min. to heat, then one slice in 1 min. 22 sec.
Iron	600 watts	—	Spittle heat, 4 min.; on dry goods, 3 hours' work with 1 hour's current.

Electric irons, used 9¼ to 10½ hours a day, consumed from 2·2 to 4·9 units each.

III.—POWER.

I now wish to refer to certain statements made in catalogues as to the cost of electric driving. The following table gives the cost of electric driving to a number of trades, and amongst these are trades using electrical energy for 54 hours a week, and, in some cases, 108 hours a week. These figures are taken from the records of the Glasgow Corporation Electricity Department.

A manufacturer, comparing the cost of electricity and of suction gas, gives detailed calculations showing, in the case of a user of 40 B.H.P. for 53 hours per week, or 2,650 hours per annum,

Class of consumer.	Cost per horse-power installed per annum.	Per horse-power of maximum demand.
Bakers	£1 19 0	£3 17 11
Butchers	2 12 3	3 14 5
Clothing manufacturers	4 13 5	6 6 1
Cranes	1 14 10	2 19 8
Dairies	2 12 8	3 12 8
Engineering trades	3 6 8	6 7 0
General furnishers	1 18 7	5 7 10
Hairdressers	2 3 0	3 11 8
Hat and cap manufacturers	3 10 11	5 9 7
Hoists	1 18 7	1 18 7
Iron and steel works	2 14 11	6 13 1
Laundries	4 16 9	6 13 5
Lead manufacturers	1 12 4	2 1 6
Motor and cycle manufacturers	4 4 7	5 12 0
Printer and publishers	2 5 11	4 8 7
Sausage makers	1 17 7	2 10 4
Sawmills	1 9 3	1 15 4
Sculptors and marble cutters	3 5 1	3 14 11
Soap manufacturers	3 10 8	4 19 5
Tanners	2 9 4	4 11 8
Tool makers and cutlers	2 1 11	3 11 4
Tube manufacturers	2 19 10	5 1 3
Vacuum cleaning, &c.	3 5 11	3 5 11
Wood polishing (floors)	0 16 7	1 7 8
Wrights	1 3 0	1 18 2

that electric energy at 1d per unit (excluding the rent of a motor) costs £9 14s. 8d. per H.P. per annum, or, including interest, £10; and that suction gas plant costs on the same basis £2 1s. per H.P. per annum, and, including interest, £3 1s. From the table you will observe that in no case in the City of Glasgow does elec-

tricity cost anything like the figure given by the gas authority just quoted. Further, I will show you that in cases given by gas experts as showing in favour of gas, electricity still compares satisfactorily with suction gas.

We all know that an electric motor takes energy in proportion to the work it is called upon to do, up to its maximum capacity,

—	A. Maker's catalogue.	B. Peterborough works.	C.	D.
Size of installation, H.P.	40	180	450	20
Aver. working load, H.P.	40	53	360	7·8
Total H.P.-hours per ann.	106,000	202,884	2,726,000	21,200
Initial cost	£400	£2,700	£4,230	£250
Total, B.TH.U.	81,000	150,000	205,000	158,000
Annual Charges.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Fuel, 12s. per ton ...	40 4 0	166 18 0	1,298 4 8	15 11 0
Oil	6 15 0	20 3 0	135 3 10	0 2 0
Water	5 12 6	26 13 0	—	7 5 0
Wages	25 0 0	201 4 0	423 17 0	12 10 0
Repairs	5 0 0	12 6 0	50 0 0	3 10 0
Interest and depreciation	40 0 0	270 0 0	423 0 0	25 0 0
Total	122 11 6	697 4 0	2,330 5 10	63 18 0
Deductions.				
Total output in units ...	93,280	171,084	205,000	158,000
Cost per unit	0·47	0·975	0·245	1
Cost per H.P.-hour ...	0·275	0·83	0·205	0·75
Fuel per H.P.-hour, lb....	1·5	2·22	1·78	2·6
Average load, kilowatts	34	44·7	300	5·7
Total running hours ...	2,650	3,828	7,600	2,710
Cost fuel per H.P.-hour	0·0905	0·190	0·114	0·178
Cost fuel per B.TH.U. ...	0·122	0·233	0·138	0·23
Total ∫ per B.H.P., annum	£3 1s.	£12	£6 8s.	£8 8s.
cost ⌊ per H.P. installed	£3 1s.	£3 18s.	£5 5s.	£3 1s.
Load factor, per cent. ...	30	44·5	87	31

A. National Gas Engine Co.'s catalogue.
B. ELECTRICAL REVIEW, September 28th, 1906, page 491. "Cost for Working Three Gas Engines for One Month."
C. and D. *Electrician*, September 25th, 1908. "Production of Cheap Power and Suction Gas Plant."

and I very much doubt if there is a single user of electricity having a 40-H.P. motor who has an absolutely steady load of 40 H.P. for 54 hours per week and 50 weeks per annum. There is certainly not one connected to the Corporation's electricity department's mains. We further know that a suction gas plant does not vary its coal or fuel consumption according to the load or demands made upon it. In the above table I give three cases of suction gas plant costs. As these cases have been quoted by suction gas plant experts, we may take it that they are not unfavourable examples of the running costs for suction gas plant. I would draw your attention to the discrepancy between the figures quoted in the maker's catalogue and those actually obtained. The fuel costs are only equal to what can be got with steam plant under similar conditions

Another consideration is the comparative reliability of the two methods of obtaining power. The Municipal Electrical Association is considering the promotion of a Bill in Parliament to enable municipalities to demand a minimum revenue from consumers taking a supply of electrical energy for motors used as a stand-by to gas engine plant. The fact that there is a sufficient number of stand-by motors connected to corporation mains throughout the country to warrant the promotion of such a Bill would seem to be strong presumptive evidence against the general reliability of the gas engine. No one, I am sure, with equal costs would hesitate for a moment in choosing between electricity and gas engines.

There are other vital points to be considered—*e.g.*, if one large unit, such as a 300-H.P. gas engine, is required to drive a works, the economies possible through sub-division of power with electric motors are lost in the case of the gas engine. With motors it might be possible for a great part of the time to do with 75 per cent. of the total power required. The horse-power-hours of the gas engine will certainly be 25 per cent. more than the equivalent in Board of Trade units taken.

DISCUSSION.

MR. PARSONS was not altogether in agreement with Mr. Lackie's figures, particularly in connection with heating. The author had said that heating with electricity at 1d. was like heating with coal at 20s. per ton. If they took a living room of 2,800 cb. ft., they wanted that in Scotland warmed from November to April, roughly for about 182 days of about 14 hours each, equal to about 2,548 hours. Assuming that they required a rise of 20° F., that would mean 4,841 units, which at 1d. came to over £20. His average coal bill for six years for kitchen, drawing and dining and sometimes two bedrooms, on the other hand, was £6 11s. Until Mr. Ferranti's figure of ½d. was reached it was no good putting forward electricity as a medium for ordinary heating. It would only be of any good for occasional use. With regard to cooking, electricity might be of some use for roasting, but it cost double what gas did. In boiling, unless they had a self-contained apparatus, the process took a long time, and when boiling did begin it could not be regulated. He had also tried an electric grill, but it was not a success. With Mr. Lackie's figures for driving he thought they would all concur.

PROF. BAILY held that it was of no use talking about electric heating, as they could not compare it with the old-fashioned coal fire. He had carried out experiments and made calculations similar to those spoken of by Mr. Parsons, and found that for three rooms and occasionally a bedroom, heating by electricity at 1d. per unit would cost £85 per annum. He took longer hours than Mr. Parsons and had larger space to heat. He had also tried electric heaters, but they were only successful in rooms opening out into a well-heated building, the radiator being all right under a desk or somewhere where they could in a manner sit upon it. Water heating by electricity for baths, washing up and other purposes he estimated as costing 2s. 6d. a day or about £40 a year, and in order to make electricity compete favourably with the kitchen fire for that purpose they would have to have energy at less than ½d. per unit.

MR. H. A. MAVOR contended that the principal reason why electric heating could never be looked upon as a profitable thing for the general heating of a house, was that the electric unit was produced from coal, steam and an engine, from which they could only extract 10 per cent. thermal efficiency, and electricity was therefore bound to be dearer than coal. It was impossible that electric heating could bear comparison with coal in an open fire as a matter of economy. With regard to cooking, economic comparisons on a large scale were against electricity; but in the application of electricity to the vacuum cleaner, he thought there was a promising outlet for their activities.

MR. T. BLACKWOOD MURRAY gave statistics of the working of gas engines in his place of business, and argued from the figures that 1d. per unit for electrical energy in such works as those of his firm would mean doubling the annual running cost. He did not see, on the other hand, how it could not be possible for an electrical supply company to supply energy at ½d. If that were possible there would be little chance of gas competing.

MR. J. A. ROBERTSON said he had carried out cooking experiments for some four years with different types of ovens, and he could not agree altogether with Mr. Parsons that electric cooking was a failure. He held to the opinion that a roast or steak electrically cooked was very different from the same article cooked with coal or gas, where it was bound to absorb more or less the products of combustion. With regard to the problems of heating and ventilation, he thought they ought to be careful in expressing opinions, as those questions had to be considered in each particular case according to local requirements. They were not going to warm a room by simply putting down a convector without any regard to air inlets, and it was a fact that it was difficult to convince an average man that the temperature was not being raised unless there was a huge blazing fire in a room.

MR. WM. SILLERY said that he did not agree with the author's conclusions as to heat radiation as a fog penetrator. From experiments he had found that single 1,000-C.P. Osram lamps used for street lighting penetrated the fog better than 2,000-C.P. arc lamps. His opinion was that for cooking and other domestic purposes electricity was not now recognised as a luxury, but as a necessity. Comparisons with older methods showed electricity to possess distinct advantages, and it only remained for manufacturers to put upon the market more reliable heating elements.

MR. LACKIE, in reply, said he did not recommend the continuous use of electric heating at 1d., although he knew of one or two cases where it had been done quite satisfactorily. He thought Mr. Parsons was wrong in taking out the heating of his house at anything like 2,700 hours in the year. They used to complain of power users assuming that they had a 100 per cent. load factor, and this was what Mr. Parsons had done with the heating of his house. If they considered for a moment what heating was actually required, they would see that there was nothing like this number of hours of heating necessary. From a quarter to half an hour in the bedroom in the morning, one hour for breakfast in the dining room, and an hour at night for dinner really only left one room to be heated for the number of hours given by Mr. Parsons. Prof. Baily's remarks confirmed his own opinion about the open coal fire. The question of electric heating should not be looked at from the absolutely £ s. d. point of view. There was the question of atmospheric purification, no dirt and no ashes. Mr. Murray's figures on suction plant were interesting, but it must be remembered that he had not a continuous supply for 8,760 hours in the year, and the probability was that if he did have such a supply his wages bill would be three times what it was with the present running. The general result of the Corporation offering electrical energy for heating and cooking at 1d. per unit had been most satisfactory to him, and they had had quite a number of letters from consumers expressing their satisfaction with the electric radiator. Electric heating of water on a large scale did present a difficulty, but on a small scale, only last week a syndicate was formed to exploit and put on the market a heating apparatus which could be attached to any ordinary water tap.

Submarine Cables for Long-Distance Telephone Circuits.

By MAJOR W. A. J. O'MEARA, C.M.G., M.I.E.E.

(*Discussion on paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS, *December 15th*, 1910. *For abstract of the paper see* ELEC. REV., *December 23rd and 30th, and January 6th.*)

THIS discussion, which occupied the best part of two evenings, was opened by DR. FLEMING, who remarked on the simplicity of Pupin's law, with which the Anglo-French cable practically complied. Prof. Pupin first showed that cables could be made with intermittent inductance, which would equal uniformly loaded cables. It had also been shown that the same law was followed by a

type of cable suggested by Prof. S. P. Thompson. The paper seemed to show discrepancies between the calculated attenuation constant and that found experimentally for uniformly loaded cables; this might be due to a difficulty in finding the true permeability of iron at high frequencies, the value of which was probably lower than expected.

MR. W. DIESELHORST said remarks were made at the Telegraph Conference at Paris suggesting a difficulty in repairing loaded cables, but he did not think a telegraph engineer would experience any difficulty. More loading coils were inserted than were required theoretically, and a considerable displacement of several coils during repairs would not affect the cable.

SIR JOHN GAVEY said the limits of speech with the old cables across the Straits from London were Lyons and Marseilles, so that Astrachan was a great increase in range and due to the adoption of loading coils. He had found that iron in the core of a loading coil increased the distance, but decreased the articulation of speech. He thought there was a future before the continuous loaded cable in connection with trunk telephone lines. The expansion of electric tramways in this country had led to the trunk lines being provided with protective devices and to a general increase in effective resistance. The Post Office would have to face the possibility of most of the overhead wires being put underground, and in this connection the question of continuous loading could be considered. With an experimental cable of that kind recently made to his specification, an improvement of 70 per cent. in β was calculated, and the speaking test showed 77 per cent. improvement. Better results still were obtained later; one mile of the cable equalled 4·7 miles of standard cable, and the speaking test showed an improvement of 94 per cent. From these results they gathered that using properly treated iron, the ordinary Pupin formulæ would give accurate results.

MR. H. R. KEMPE said his investigations were more with a view to simplifying theory, to bring it into practical shape. Mr. Dieselhorst had proved to him the possibility of using such loaded cables practically—a matter which was much doubted—and the result had proved almost all that could be expected. The experimental coils originally shown by Mr. Dieselhorst were practically similar to those in use. He (the speaker) had had the cable under his observation and test ever since it was laid, and its condition to-day was as perfect as any ordinary cable, and there was no doubt of its lasting equally well; moreover, if it did fail, it was easy to repair. There was some difference of opinion as to the best system of loading; if the actual cost were considered, the efficiency of the coil-loaded cable would be less than that of a continuously loaded cable. Apart from the question of cheapness, loading by coils might be better, because more coils could be added to increase its speaking capacity, if desired. Improvement was quite possible without loading, but the loading got rid of "drumminess." An improvement of 70 per cent. had been obtained by continuous loading, while 220 per cent. had been shown by coil loading. Audition was a matter of opinion; the first laid cable was considered satisfactory, but, no doubt, the loaded cable would now be considered much better. Given more knowledge, the various constants in the formulæ would be simplified, and their practical utility enormously increased.

MR. A. WHALLEY asked for further information on a number of points. He said presumably the introduction of loading coils with thin insulation called for special lightning protection. The values of β appeared to differ considerably, and it seemed important to make it clear how far this, in the loaded cable, was due to frequency and terminal losses. Speech tests were shown to be unreliable in the paper, and he hoped the alternative method with frequency control would be developed.

MR. ALEX. SIEMENS wished it to be clearly understood that he did not intend to suggest that the numerous cable repairs were due to ordinary faults, as actually they were, he believed, due to fishermen's anchors.

PROF. S. P. THOMPSON said the difficulty with mathematical calculation was to know just how to apply it. A calculation, correct for one frequency, was wrong for all others; at best, an average result was obtained, and experiment must play a greater part than theory. It had been pointed out that there was an apparent increase in resistance due to the use of continuous loading, and to induction coils in series; if the coils were used as inductive shunts, this did not apply. He had some years earlier suggested the placing of inductive shunts along a telegraph cable. Such shunts at suitable intervals would permit of speech over the longest cable. The speed of telegraph working had been greatly increased by putting inductive shunts at the ends of cables, and that demonstrated the value of his suggestion. If an Atlantic cable were required to give 300 words per minute, a shunt would be required every 360 miles, and at lesser intervals if a higher speed were required.

The RT. HON. HERBERT SAMUEL, M.P. (Postmaster-General), referred to the improved speaking over the new Paris cable, and said the chief engineer had promised, subject to a co-treasury, to give them telephonic speech to Calcutta. They would, through the use of the new cable, shortly be able to reduce the cost of speaking to Paris by 50 per cent. The P.O. was becoming a more and more highly specialised field of engineering, and changes were pending with a view to efficiently meeting the needs of the department in this direction.

MR. FRANK GILL (National Telephone Co.) said he hoped he could now congratulate Major O'Meara on having given up air-core coils and adopted iron-core coils, which had been available some years. The paper showed a poor case for continuously loaded submarine cables, but the case for landlines, as ordinarily laid, was much worse; continuous loading increased the cost of the lead sheathing and of the duct. In the previous discussion, Sir John Gavey had given a case of what was presumably a three-mile underground cable at the end of a trunk line. This was a 100-lb. cable lapped with iron tape; attenuation constant, ·0207. You could get equivalent speech with a 70-lb. cable loaded at two points, and the relative annual costs would be 100 to 37 in the latter case. The National Telephone Co. had now loaded or loading over 2,500 miles of cable in short lengths. As an example, a short (3½-mile) length of 20-lb. cable would have two coils, reducing the length from 3·5 to 1·9; the use of single coils in short lengths gave improvements of 1·2 to 2. The thing which measured talk was not β, but βl, and it seemed that length should have a place in the constant. This, however, ignored the wave-length.

MR. DANE SINCLAIR said there was a time when iron in long cables was anathema; then came the combination of copper and iron; now the problem was to make the best use of copper in conjunction with iron. The Pupin coils gave the best results in this way, but they had disadvantages; if, for instance, they were installed every few miles from London to Glasgow, they would be equivalent to the test boxes which, with their numerous joints, were the great drawback on long lines in the old days. The continuous loaded cable got over the joint difficulty; one cable recently tested gave 102 per cent. improvement, and even better results had been obtained. This type of loading did not prevent the cable from being pulled into existing ducts; it enabled one to get at least 100 per cent. better speech at 50 per cent. added cost; approximately twice the weight of copper as of iron was used in the cable, and the annealing of the iron was extremely important.

MR. TREMAIN thought it was fallacious to take the cost of a submarine cable without taking into account the cost of the landlines at the ends, and one might spend much more on such a cable and yet save money at the finish on the land connections. As regarded loaded aerial lines, a pair of such wires would be very susceptible to interference from outside sources. The depreciation of heavy telephone cables reached a high figure, chiefly owing to the difficulty in the way of open lines in cities. He had tried Prof. Thompson's suggested arrangement of shunt coils, but found much better results from the series coil loading.

MR. W. W. COOK suggested that there was some doubt as to the possibility of talking between London and Astrachan, in view of the reduction in effective conductivity in landlines mentioned by speakers. The success of the latest Anglo-French cable should have an important bearing on Anglo-Irish communication, which at present was carried on *via* Scotland, on account of the short submarine route. It might be feasible to take a more southerly route and save money on landlines.

MR. A. CAMPBELL gave the results of some tests, carried out at the National Physical Laboratory on experimental samples of loaded and unloaded telephone cable. In the case of one of these cables, the iron strip loading was tested, to low values of H, with a view to producing permeability values such as occur in telephone cables. A portion was annealed in hydrogen at 850° C., and this raised the working permeability from 125 to 235. It was, however, found that the mechanical treatment of the strip in placing it on the cable practically destroyed the advantages accruing from previous annealing.

MR. W. M. MORDEY said it seemed as if it ought to be better to deal with a distributed fault by means of a distributed remedy. Mr. Campbell's curves reminded him that very little had been done at the beginning of the permeability curve.

MR. W. P. GRANVILLE thought the reputed comparative improvement in speaking over the Anglo-French cable was rather misleading, as the higher cost would enable more copper to be used in the ordinary way, which would give twice as good a result as had been previously obtained. He thought that more copper and fewer coils would give a better result than the small conductor used in the Anglo-French loaded cable; probably a heavy conductor with light continuous loading would be used in the future.

MR. COHEN (N.T. Co.) suggested that if the end loading coils in the Anglo-French cable had been placed in the cable huts instead of half-a-mile out at sea, an improvement would have resulted in the adjoining landlines. Speech-testing was a matter of practice, and in future we should be able to substitute for it some definite form of test. The speaker showed a series of curves of variation with frequency of the attenuation constant for an unloaded, a parallel loaded, and a series loaded cable—such as the Anglo-French cable, which last showed no appreciable variation at the usual frequencies employed.

MR. J. E. KINGSBURY said as regarded the speech tests, the human element could not be eliminated, even if one worked through an instrument. We could not afford to use anything but the best in telephone cable work, as very wide differences in speech occurred, and it might be that while English could be successfully spoken over a cable, it would not be adapted for other languages.

MAJOR O'MEARA briefly explained a few points raised in the discussion, but owing to the late hour, decided to defer his reply.

Electricity in N.S.W. Collieries.

THE paper read by Mr. E. Kilburn Scott (see ELECTRICAL REVIEW, page 122), before the ASSOCIATION OF MINING ELECTRICAL ENGINEERS, was discussed by the London Branch on the 17th inst.

The CHAIRMAN, Mr. W. Maurice, in opening the discussion, said that, in his opinion, there were no coal-cutters in the world so well designed, so well constructed, so admirably adapted to requirements, and so capable of continuous heavy duty as the machines which were being made in England and in Scotland to-day. Barring heading machines, he stoutly denied that there was any American machine on the market which could touch the very worst machine produced in this country. The use of coach screws and insulators to carry the cables had been abandoned

in English collieries for years; the English practice was simply to drive road nails into the mine timbers, and to sling the cables from pieces of leather or brattice cloth.

MR. BOOT (Tunbridge Wells) said he inferred that the Americans had exploited Australia more than Britishers had, because they found wherever Americans went that they were fond of putting in direct-current plant. It appeared to him that the plant would have been much safer and simpler, and cheaper, had three-phase been universally adopted. That was the practice in all the latest mining plants in this country.

MR. H. MORGANS said he had had some experience of trying to work coal-cutters in India, which were all air-driven, as they had not electrical plant available. The conditions in India were extremely arduous, because the temperature was high and the air coming in hot got cooled in the workings: it being hotter outside than inside, and below the dew point, it was extremely moist. At the International Mining Congress in Germany last year a German read a paper on coal-cutting machines, in which he said, "where long-wall work is practised the 'pick-quick' bar machine of Mavor and Coulson, Glasgow, is the machine of the future." At the Bristol and Somersetshire coalfield the bar machine was making its way very successfully. Electric motors were in bad odour in this country just now, when they were applied to coal-cutting machines, and he thought they should be very careful about the design of coal-cutter motors. The motors ought to be built with plenty of insulation, not caring much what the efficiency was, so long as they would take the cutter through whatever there was to do.

MR. ARUNDEL, referring to the practice in New South Wales of immersing the trail cables in water at least once a week for protective purposes, said the St. Helen's Cable and Rubber Co. had recently introduced a cable which they claimed would stand that test. The cores were made of ordinary C.M.A. flexible, and sheathed with a special rubber exactly similar to a cab tire. It was very flexible, very light, would stand compression and abrasion well, and was easily repaired. Trail cables often had to be examined and shifted while the current was on. His company had found that by passing cable through the hands the rubber glove got worn, and they had introduced a glove with a leather palm.

MR. BROCKLEHURST said that they had to economise space as much as possible, and if they strengthened the motor it became rather cumbersome, especially in coal-cutting machines.

MR. DURTNALL said that one of the greatest difficulties in designing motors for this class of work was the starting gear that was necessary if a three-phase alternating current were utilised. The high starting torque necessary could be obtained by varying the frequency of supply of the induction motor at starting by suitable controllers, changing the frequency as the speed rose.

MR. KILBURN SCOTT, replying, said it was quite impossible, when a trailing cable was laid down in a mine, to walk along and examine it by hand. There had been cases where a man had walked along too quickly and had been killed. Mr. Black, of the Weymss Coal Co., in Scotland, had developed a device which he used for testing all the cables along the pit. They had 20 miles of cables, and of course he had to get along pretty quickly. Instead of peering about he carried a voltmeter and walked along, trailing an insulated contact brush on the cable. In New Zealand every wireman in the city of Wellington had to have a wireman's licence. The skilled journeymen wiremen had their wages fixed at 16d. an hour, but to prove their skill they had to pass a written and practical examination. If a man who held a certificate did some careless work, the inspector on finding it endorsed the man's certificate, and if he did that three times he lost his certificate for one year at least. They had also another examination for men who worked at 1s. 6d. or more an hour, who did all the fitting of the electric lifts and the motors and such like in factories. All the latest collieries, which happened to be south of Sydney, were three-phase, and in one of the collieries they carried the three-phase cable in by about 2 or 3 miles; it was laid in bitumen down the main road and carried to the haulages. The coal was found in the side of a cliff that faced the ocean all the way along the coast, and they did not require big winding plants, except in the case of Sydney Harbour. The haulages in the mine were either main and pulley or continuous. The latest pumping was always done by two or three centrifugal pumps or turbines driven by three-phase motors; there was not a great deal of pumping.

LEGAL.

METROPOLITAN ELECTRIC SUPPLY CO.'S ASSESSMENT.—IMPORTANT ELECTRICAL APPEAL.

THE Middlesex Quarter Sessions on Wednesday, January 18th, commenced an appeal by the Metropolitan Electric Supply Co. against the assessment of their power station at Willesden by the Willesden Assessment Committee, which had been placed as £20,000 gross, £13,000 rateable.

Sir C. A. Cripps, K.C., Mr. W. W. Ryde, K.C., and Mr. H. R. Ward appeared for the Company, and Mr. E. Page, K.C., and Mr. Komstam for the Committee.

In a brief opening, SIR C. A. CRIPPS pointed out that now that the Marylebone Council had acquired a portion of the undertaking, circumstances had much changed, and the plant was now too large The appeal was a very important one, and raised many questions of interest.

MR. CONACHER, who is now the general manager of the Cambrian Railway Co., said he was formerly manager of this company, and they came to the conclusion that the sinking fund must be £20,000 a year. In 1909 at Willesden they actually expended in repairs on the buildings £898, and plant £5,609. That was entirely distinct from the sinking fund. About a third of the whole capital of the company was in the Willesden power house. The capital was £1,898,000. The station cost £296,178, and the machinery £316,997, making £613,175. The land was not included; that would not depreciate, but, he hoped, appreciate. The area was about 10 acres, but was not all used. One-third of the capital was in mains, which had a much longer life than machinery, and the sub-stations accounted for the remainder. The depreciation on this item was much less than on the machinery, therefore much more of the £20,000 should be allocated to the power station. He knew of no plant which required to be kept in a higher state of efficiency than electrical plant, because of the very high tension of the machinery and the statutory obligations. Most of the engines were of 3,000 KW. The output was 16,500 KW., which was now about 3,000 more than was needed, because of the separation of Marylebone. They, therefore, had 2/11ths more than they needed. He took ¾ per cent. on the original cost of the buildings for depreciation, and taking 9/11ths of that, it came to £1,872. The cost of insurance was £378. The actual amount spent in 1909 in repairs to machinery was £5,068. The instruments would be tenant's capital, and all they put in was the landlord's capital. He reckoned 10 years to 25 years' life for different parts of the machinery. The cost of repair was 4·83 per cent. of capital costs, say, 5 per cent. The £5,068 was for repairs only, and the proportion of the sinking fund applicable was 9/11ths. In his opinion £15,645 of that could be deducted from the gross value. This was arrived at after seven years' experience. The suggestion of £7,000 made by the respondents would only allow £600 for depreciation. If he had thought that enough he would never have advised his board to set aside a quarter of a million of cash to guard against this contingency.

Cross-examined by MR. E. PAGE: He had not considered whether £4,355 was the correct net value. He knew an agreement was made in 1906 as to the rateable value. He had a different opinion after the Marylebone separation. No action was taken because they thought there would be an increase, but the metal-filament lamp, by reducing the consumption, had kept the normal increase of consumption down. In 1906 he might have agreed the statutable deductions as £5,817. The gross was then £17,432, and the net £11,635. It was true that if £15,000 was to be the statutables the net would only be £2,000. The Willesden authorities suggested a conference to discuss an increase, but his reply was that no conference could be held unless it was for the purposes of a reduction. No steps were taken to get a reduction, because the company were of opinion that their business would improve. The machinery was only working up to 50 per cent. of its capacity. The engines were very large ones—3,000 KW. The maximum demand last winter was about 9,600 KW. The stand-by depended upon the size of the plant, but this station was built for large machines. He could not agree that 25 per cent. was the usual stand-by. The company had five sub-stations in the metropolitan area. All their money came from the metropolis excepting what Acton paid for a bulk supply. Running expenses should not be in the account for repairs. He did not say the company should set aside a fixed amount, but an average amount. When the Marylebone purchase and the removal of the Kingsway station took place a large sum was placed to sinking fund account, which did not, therefore, necessitate so large a sum being set aside in later years. The company had half an acre of freehold land in the Kingsway neighbourhood which was worth much more than it stood at in the books. The idea was to obtain a sinking fund in 22 years of £630,000. If £20,000 was provided yearly, this would be £680,000. No interest was shown, but if interest was shown, the amount to set aside would be less, but it was the same thing in the end.

By the COURT: The interest on the sinking fund was now divided with the profits.

Cross-examined: He did not admit that the interest should be added to the amount set aside for sinking fund. He could not accept the statement that if that was done the amount would be less than £20,000.

MR. PAGE pointed out that when the property was shown as being £30,000 or £40,000 less than now, the rateable value was some thousands of pounds more than was now asked. In 1931 the local authorities would have the right to acquire the property of all the companies in London.—He hoped at that time the value of the property would be two-thirds of the capital. The first few years nothing was set aside for sinking fund, as nothing was earned.

MR. PAGE contended that the sinking fund should commence at the beginning—otherwise it might be that all the fund might be provided in the last five years.

The WITNESS said that would be unwise, but it was in the hands of the shareholders. The engineer to the company said it was necessary to provide against breakdown to run the three 3,000 engines, and four 1,500. The engines had to run at high velocity and tension. The time of running was increasing owing to the day consumption. The engineers who laid down the plant had to keep it in order for two years, so that the cost of repairs in that time would be lower than subsequeutly. The life of the boilers, dynamos, &c., he put at 25 years. The depreciation of plant had always been a question; but about five years ago Mr. Robert Hammond read a paper on the subject, and his figures were generally accepted. They were the figures given by him.

Cross-examined: He put the life of pipework, engines, dynamos

accumulators and transformers at 25 years. Cooling towers would be obsolete before they wore out; the pumping engines were good ones. He was sure the Sulzer engines, though good ones, would not last more than 25 years if all the engines were taken together. He was taking the average of all the engines. About 20 years was the life of a switchboard, not 30. The life of the machines in the tool shop he put at 10, not 20, years. He did not think the present buildings would be there in 100 years. The walls would last 100 years, no doubt, but the roof would not. Twenty-five per cent. would not be a good stand-by. He wanted a stand-by of 2 units. That was the usual stand-by. The units sold in 1909 were 11,900,000, and the amount generated was about 13 or 14 millions. He did not think it 18,000,000. He did not remember the figure. The maximum demand in 1909 and 1910 was about the same. That was the largest amount ever required at any one time. He did not think much importance was to be given to the published figures. The percentages were worked out from the Board of Trade figures, and mostly differed. Soda ash was, no doubt, used for softening the water. Candles were used for lights.

MR. PAGE put it to him that red ink, winding clocks, carbons, &c., were not repairs, but were all running expenses, but the witness would not agree that all the items were not repairs.

Replying to SIR A. C. CRIPPS, MR. PAGE said about 40 per cent. of the items were not repairs, but running charges.

In re-examination, the WITNESS said that all that were charged as repairs were all incidentals to repairs. It was possible that £150 might be said to be running charges, but he thought it properly was repairs. He could run another 3,000 KW. with his plant.

MR. ROBT. HAMMOND gave evidence that he usually reckoned about 1 per cent. per annum for repairs. He had specially studied this question of depreciation. The Local Government Board took rather lower figures than he did. The tables published were done by him for many years, and accepted. The meters on the switchboard and the feeders of this company would differ, because the company had a long distributing line. The machinery they now had was too large, and he thought 9/11ths a fair quantity to use. The spare power was less than 25 per cent. When the Marylebone supply was being carried on the company had other stations. He should not, in all probability, design the machinery on the present basis. He did not think the four 3,000-KW. sets is a bad lot for a demand of 9,500. He would not have, in this case, the 1,500-KW. machines. He did not know that £87,000 had been spent at Willesden since 1097. He thought the statutables were £15,122.

By the COURT: His figures were quite independent. He took 1 per cent. on the capital spent for repairs, and the sinking fund he took was similar to that which Mr. Conacher took. He based his item for sinking fund for the buildings the same as the Local Government Board—viz., 60 years.

MR. HUMPHREY DAVIES, a valuer, also gave evidence, and said 1½ per cent. should be set aside for repairs and renewals, and that would not include obsolete plant. The repairing shop was a separate one, and had to be heated.

Cross-examined: The renewals were not numerous. He did not say that the rateable value should be £6,875. What he did say was that upon the basis of another station in the same district that should be the rateable value.

On Thursday, January 19th, MR. E. PAGE, in opening the case fof the respondents, said he was going very closely into the matter, and by doing so he would show that instead of £5,927 for repairs, it should only be £2,711, or less than half, the remainder being running charges. As to sinking fund, he contended that the possible loss of capital by purchase of the undertaking by the local authorities should not come in. That £20,000 should be disregarded. He said that the proper fraction was 8/11ths and not 9/11ths. The increase of the gross value from £17,452 to £20,000 was because £80,000 had been expended there in the interim. The appellants said the £80,000 had been thrown away, that a sum equal to £3,000 a year had been spent without result, but, on the contrary, had been a loss to them. He reminded the Court that the sale to Marylebone was completed when the assessment was agreed at £17,452.

SIR ALFRED CRIPPS said most of the £80,000 was spent outside Willesden.

MR. B. W. HARDCASTLE, accountant, said he went through the appellants' accounts. He analysed the accounts with regard to maintenance, but he did not accept all the details as entered as being applicable to repairs. He was of opinion that the item for loose tools, renewals, additions and alterations should be charged to running expenses. This included soft soap, waste, candles, mop heads, paste, paraffin, disinfectants, gas, coke, mats, emery cloth, gauge glasses, recording ink, pens, papers, winding clocks, fuses, carboys and acids, weighbridge and weighbridge tickets, wages for sweeping and removing refuse; these were not repairs, in his opinion, neither was the maintenance of the railway siding. The figures for those items in 1909 were about the same as for the years 1906, 1907 and 1908. The total of these came to £1,279, and he was of opinion that that should not be charged. This had relation to materials only. The company's item was £2,358. The repairs to the building he agreed as £809. The difference was in the wages, and he was of opinion that £3,371 for wages was subject to a deduction. Taking the three years, he was of opinion that the wages should be £2,278, and taking the average repairs, the average total should be £3,314. Some items in the insurance account ought not to be included in the deductions, and that item ought to be £136 less than the company put it at. Deducting the 2/11ths left a total for repairs of £2,954.

Cross-examined by SIR ALFRED CRIPPS: All the items charged could not be applicable to repairs. He was told that all the cost of the repairing shops was separately charged. He agreed that these were engineering items. He was not aware that there was a separate repairing staff of two foremen and 40 men, but he did know that if these men did some of the work charged for it should not be included in repairs. A contractor would charge a profit, but he found none charged here, though he was told there was something.

SIR ALFRED CRIPPS: Nothing is charged here. Not even for the chief engineer or other members of the staff.

MR. J. F. C. SNELL, of Messrs. Preece, Cardew and Snell, said he had 22 years' experience of electrical supply work. He had been to the station on several occasions before he went to inspect for this purpose. A good many of the items charged were renewals, extensions and replacements. They were not repairs. The maximum demand was 9,400 kilovolt-amperes, which should not be confused with kilowatts. The plant was equal to 16,500 KW. The 9,400 K.V.A. might be represented by 9,000 KW. He thought that 25 per cent. could be taken for an hour as overload at least. The maximum load, in this station, was for a very short time. The ordinary running plant need not be more than 9,000 KW. with a stand-by of 3,000. By this means he was able to bring the valuation to the figure of 8/11ths. Cost had little to do with value, and when purchased this plant was much more expensive than now. The value of the plant was £228,219, which left £153,167. Some of the buildings were used for the whole undertaking, but others were not. He therefore valued the buildings at £283,689.

A large number of tables containing many sets of figures were put in, and drew from the chairman (Mr. Montague Sharpe) the remark, "Oh, these figures."

The WITNESS went on to say that he had taken the life of the buildings as 80 years. Some of the "lives" he had taken at less than the appellants. He put the buildings and plant at £383,000. The valuations he had placed were the actual figures in tenders he had received. The life of the engines he had put at 50 years, as the principal ones were slow-speed marine engines. He saw no reason why these engines, properly maintained, should not last longer than waterworks engines. He thought they should apply a 3½ per cent. table, and not as appellants had, a 3 per cent. The total statutables he put at £6,438, and that was a fair figure he thought for this particular company. A modern station could be installed at much less cost than this.

SIR ALFRED CRIPPS said this was not relevant.

The CHAIRMAN said this was a hereditament the tenant could not move out of.

Cross-examined: If he spent £100,000 to get that trade he must provide for it. He had based his sinking fund on replacing the plant, which, at the end of the time, could be much more cheaply replaced.

In answer to further questions, the WITNESS said that he allowed 1¼ per cent. for the depreciation of plant and buildings as against the appellants' 5 per cent. To get the original capital back in 38 years would be about 1½ per cent. He allowed ½ per cent. for the buildings. If repairs were added to renewals, the percentage was 2¾ per cent.; 50 years was longer than usual for engines, but these were exceptional. Generally speaking, Mr. Hammond was right. Engineers agreed, as a rule, that the life of engines was from 25 to 30 years. He did not know the power factor was 96, he took it at 90. If the power factor was 96, the difference was very little. The difference was this, that whereas the company wanted 13,500 KW., he thought 12,000 was enough. It was very difficult to allocate items to repairs or renewals.

By the COURT: He was unable to do more than draw upon his experience and practice in allocating the items.

MR. PAGE submitted that the question was whether the local authorities could purchase or not.

The CHAIRMAN pointed out that to buy at the suggested figure surely could only be done if an undertaking was going abegging.

The WITNESS said the £400,000 he had referred to would purchase all that there was at Willesden.

The CHAIRMAN said that at the end of 1931 the company came to an end. Then the company had to refund the capital.

A MEMBER OF THE BENCH: Where would the shareholders be?

MR. JAMES SWINBURNE, past-president of the Institution, said that for a maximum load of 9,000 KW., 12,000 was sufficient. The maximum load was only experienced for a very short period in the year and the "overload" capacity could be used for this purpose. The maximum life allowed by Mr. Snell was high. The usual life was 25 to 30 years for an engine. These engines would last a long time, but the time the engine was working had to be considered.

MR. WM. PATRICK RYAN, of Messrs. Morris & Ryan, spoke to the valuation of the appellants' property. He had compared the cost of repairs and renewals of this company and others. He practically agreed with Mr. Snell's valuation. Capital value he took as the present value. It depended upon what the sinking fund was for, as to the amount of it. So far as rating went, the sinking fund did not mean more than to produce the amount of the hereditament. The sinking fund for this purpose should not be on the basis of capital. Frequently the capital was enormous in electrical undertakings, but for rating purposes they took about a third.

Cross-examined: If he were advising a company as to the amount to provide a sinking fund for, he would value on the outlay, but not for rating—hence the value.

MR. CHARLES JONES, rating valuer to many authorities and electric light undertakings, gave evidence, and pointed out that a large part of the company's undertakings was indirectly productive to the power station. He only knew one company who provided a sinking fund to enable them to repay their capital. After their "lives" there was a residual value in the plant. They should have

no consideration as to what a local authority would give in 1931, but only as to the rental value a hypothetical tenant would pay.

By the COURT: He had not considered the 1931 point. He had not taken the peculiar circumstances into account at all.

SIR A. CRIPPS: If the cost was £618,000, and you say the value is now under £380,000, they had depreciated £238,000, which in eight years is about £30,000 a year.

The WITNESS said, as a matter of arithmetic, that was so, but he had not dealt with it on such a basis. He had nothing to do with the arithmetic.

SIR ALFRED: If it was anything like that then the appellants had not put depreciation too high.

The WITNESS: You may depend upon it they had put it as high as they could. Take bricks alone, they are at least 30 per cent. less than they were when the building was put up.

Re-examined: He had taken the present value.

MR. PAGE said if the Court took into account the 1931 question, he asked that a case should be stated for the High Court.

SIR ALFRED CRIPPS denied that there was any point of law in the case at all, and if they were to take Mr. Jones's figures, the amount to be allowed for repairs alone would be £30,000 a year. The amounts had been allocated to the best of the ability of the engineer who carried out the work. The respondents thought the gross was too low, so they tried to get the statutables cut as low as possible.

Replying to a member of the Bench, MR. PAGE said that, though it would be prudent to provide a sinking fund to redeem capital, that was not the point to discuss in this case.

The Court, after a consultation in private, fixed the gross at £20,000, net £8,900, and allowed appellants their costs.

MANBY *v.* G.N. AND PICCADILLY RAILWAY CO.

MR. JUSTICE GRANTHAM, sitting with a common jury in the King's Bench on Thursday of last week, awarded £50 as damages to Mrs. Manby against the defendants. Plaintiff sustained injuries in consequence of the negligence of the lift attendant at South Kensington Station who, in June last, shut the lift door upon her arm. The lift is of an unusual character, having two stops, which necessitated, said counsel, extra caution on the part of the person in charge, as passengers frequently made mistakes and got out at the wrong place, and then got in again before the lift moved.

On Friday, in the Court of Appeal, before Lords Justices Vaughan Williams, Farwell and Kennedy, on the application of the defendants, a stay of execution was granted in this case, on the terms that the defendants brought the amount of the damages into Court, and paid over the taxed costs on the usual solicitors' undertaking. It was mentioned that since the trial the plaintiff had assigned his interest in the judgment. In support of the application it was stated that the case raised a question of considerable importance to the defendant company, as they had installed at the station in question four lifts all of the same pattern as that which was alleged to have given rise to the accident.

G. FREEMAN & SONS *v.* THE MIDDLETON ELECTRIC TRACTION CO., LTD.

ON Thursday (19th inst.), in the Court of Appeal, before Lords Justices Vaughan Williams, Farwell and Kennedy, this case came on for hearing on the appeal of the plaintiffs against a judgment of Mr. Justice Hamilton, who found for the defendants.

Mr. C. A. Russell, K.C., and Mr. Macnaghten appeared for the appellants; and Mr. J. R. Atkin, K.C., and Mr. Eustace Hill for the respondents.

MR. RUSSELL said that the action was brought by the plaintiffs, a firm of contractors of Hollinwood, Lancashire, against the defendant company to recover sums amounting in the aggregate to £1,699 in respect of extra work done in connection with the construction of an electric tramway from Rochdale through Castleton to Middleton. The dispute arose out of a contract dated March 4th, 1901, for the construction of the tramway, the actual parties to it being the plaintiffs and the British Electric Traction Co., Ltd. By the terms of the contract, however, the latter company had power to substitute for themselves the Middleton Electric Traction Co., Ltd., which was done. The contract price—the lump sum mentioned in the contract—was £38,781 11s. 7d., and the plaintiffs alleged that besides the work comprised in the contract, they did extra and additional work amounting to £6,843 19s. 4d. That made a total of £45,625 10s. 11d. The plaintiffs had been paid from time to time £43,926 7s. 2d., leaving in dispute the balance claimed in this action. At the trial the learned judge was not asked to deal with any question of amount. The question was whether under the terms of the contract with regard to written orders and matters of that kind the defendants had a legal defence to the action. In the first place, it was said by the defendants that having regard to the terms of the contract, no payments for extras could be recovered unless a written order for the work was shown. With regard to that point, written orders were undoubtedly in fact given, and the question was not whether there were written orders, but whether the person who gave those written orders had authority under the contract to give them, so as to bind the defendants. Every one of the orders was given by a Mr. J. Angus (since dead) who was the resident engineer appointed for the purpose of from day to day representing the defendants on the work. The engineer named in the contract was Mr. Stephen Sellon, and an interpretation in the contract defined the word "engineer" as meaning "Stephen Sellon, Esq., or other appointed by him." The plaintiffs' case was that Angus, in regard to the giving of the orders, was "another engineer" appointed by Mr. Sellon. Mr. Justice Hamilton's view upon the construction of that part of the contract was that it meant an engineer appointed by Mr. Sellon, and who would relieve him of all his (Sellon's) duties under the contract. On the other hand, his (counsel's) contention was that it was within the power of Mr. Sellon to appoint another engineer in respect of duties which he himself could not perform, and that that was the basis of Angus's appointment. Mr. Sellon was the engineer to the British Electric Traction Co., and counsel submitted upon the facts that it was quite clear that it was within the contemplation of the parties that that gentleman would not be able, in regard to such duties as required his presence on the works, to perform those duties, and it was, therefore, intended to give him power to appoint somebody to represent him in all matters which required attention, and which, owing to his duties elsewhere, he was unable to attend to himself. In other words, it would be perfectly competent for Mr. Sellon to put Angus in his place for the purpose of giving written orders where written orders were necessary. Another important point was whether Mr. Sellon under the contract had power to give a final decision binding on the plaintiffs on the question of whether the work was work covered by the contract, or was extra and additional work. Upon the Judge's findings of fact, he (counsel) had to submit that Mr. Sellon did, with regard to the matters in dispute, come to the determination that they were extra and additional works, although it was quite true that some years later Mr. Sellon purported to give a determination the opposite way. Counsel further contended that the Judge was wrong in holding that that subsequent determination by Mr. Sellon was final and binding upon the plaintiffs under the contract. The learned Judge also found that the claim was barred by the Statute of Limitations at the end of six years, but his (counsel's) submission was that this was not a simple contract, but a contract under seal, and that, therefore, under the Statute, the action could be properly brought at any time within 20 years. Another question which the learned Judge decided against the plaintiffs, was whether they were bound to produce certificates of Mr. Sellon for the amount claimed. With regard to that, the facts showed that in regard to 80 per cent. of the sum at least, there had already been certificates. Counsel proceeded to indicate the grounds on which he submitted that Mr. Sellon did in fact determine or decide in regard to the extras. Month by month as the work proceeded Angus met the contractors for the purpose of ascertaining the amount of work done, and for which payment to the extent of 80 per cent. had to be made under the terms of the contract. On those occasions monthly statements were prepared, and in those statements Angus inserted not only the contract work but all extra work which had been done up to that time. In some cases by a particular description he defined on the face of the document that it was extra work, but in other cases the description was more general. The evidence of Mr. Sellon was that he and Angus regularly met and discussed those monthly statements, and in every case he (Sellon) had certified for 80 per cent. of the amount. That, counsel submitted, involved an acceptance of the sums shown upon those monthly statements as covering the extras. Mr. Sellon also stated that he had no doubt that at the time he went with Angus into the question of extras Therefore this state of things existed. Angus by his written orders and monthly statements expressed the opinion that the work in question was extra and additional work. Angus brought that to the knowledge of the contractors, and when he went before Mr. Sellon, that gentleman apparently raised no objection to any of the items. Mr. Justice Hamilton said that if at that time Mr. Sellon had been called upon to give a decision as to whether those works were extras or not, Mr. Sellon would have said they were. Counsel submitted that the learned Judge should have gone one step further. His Lordship should have held that there was no necessity for Mr. Sellon to be called upon in any formal manner to deal with the matter. He, however, was month by month giving his decision—a decision which in the course of business was made known to the contractors—indicating that there were extras for which the contractors were entitled to be paid.

On Friday, January 20th, MR. RUSSELL, concluding his argument, submitted that the extras claimed for were not in respect of work outside the contract. It was to be treated as work under the contract, but additional to it, and work in respect of which the plaintiffs were entitled to ask payment.

MR. MACNAGHTEN followed on the same side, and in reply to the Court, said that some of the extra work was rendered necessary by reason of the line of rails having to be shifted from the centre to the side of the road. All the extra work was recognised in the "progress" statements which were sent by Angus to Mr. Sellon month by month, and counsel submitted that it was not competent for Mr. Sellon at a very much later date—some years afterwards in fact—to purport to give a decision against the plaintiffs' claim.

In giving judgment on Saturday, without calling upon counsel for the respondents, LORD JUSTICE VAUGHAN WILLIAMS said that the appeal had been very well argued by Mr. Russell and Mr. Macnaghten on behalf of the appellants. He had an intuitive feeling that it was possible that the Court would have come to a different conclusion to that at which they had arrived, if the contract had been differently framed, and the jurisdiction of the Court

had not been excluded by the parties agreeing to the decision of Mr. Sellon being final in regard to extras. But for that he thought it very possible that he might on the facts have held that there was work done which had not been paid for. The Court, however, was bound by the terms of the contract which the parties had chosen to enter into. The story was one which had been told in that Court over and over again. He supposed there were some obvious reasons why builders and contractors were willing to enter into contracts putting themselves very much at the mercy of the architect or engineer employed by the building owners. It was a handsome compliment which builders and contractors paid to architects and engineers in their respective capacities as such. Turning to the present case, his Lordship referred at length to the terms of the contract, and said he must hold that the certificates of the engineer, which were a condition precedent to the obtaining of payment by the plaintiffs for the work in question, had not been obtained. The appellants, therefore, failed on that ground. Furtherfore, if the plaintiffs put their claim and relied upon a *quantum meruit*, that claim was statute barred. His Lordship also expressed the opinion that there was nothing in the contract or in the appointment of Mr. Angus as resident engineer which allowed that gentleman to certify or to act as a substitute for Mr. Sellon.

Lords Justices Farwell and Kennedy concurred, and the appeal was accordingly dismissed, with costs.

The Osram Lamp Works, Ltd., *v.* G. M. Boddy & Co., Ltd.

This patent action came before Mr. Justice Parker in the Chancery Division on Monday last upon a motion for judgment.

Mr. Colefax, for the plaintiffs, stated that the action was brought on some of the patents relating to the well-known Osram lamps. The defendants had consented to an order in the terms of the notice of motion, and he understood that they were represented by his learned friend, Mr. Schwann, who would appear and consent to the order. Mr. Schwann was not then present, but he did not think there would be any difficulty, as no doubt a consent brief could be produced to the Registrar. He asked for an injunction in respect of the patents mentioned, for an order that the defendants should pay the costs, and for a certificate of validity. That had been done in a case where judgment was taken by consent, and the consent here was really a consent to the validity of the patent.

His Lordship said he did not see how he could give a certificate of validity on a consent order such as this. It had been done on a motion for judgment in default of pleadings, or in default of appearance, but here, where the order was made with the consent of the defendant, he did not see how he could make an order which would in effect bind persons who were not parties to the proceedings.

Mr. Colefax said he had not come prepared with authorities, but speaking merely from his knowledge of patent cases, he thought it had been done, and done for a good many years now.

Mr. Justice Parker said that it seemed to him that he ought not to do it.

Mr. Colefax submitted that they would have obtained the certificate had the action come on for trial. It made no difference that they were only suing in respect of certain patents. His Lordship would remember the well-known saccharine case where originally they sued upon 15 patents and at a later stage upon only eight.

Mr. Justice Parker said that you might bring a patent action against anybody, get a certificate of validity, and then go against the real infringer.

Mr. Colefax said that there was no suggestion of any anything of that sort here.

His Lordship said he did not suppose that there was, but still he felt the difficulty.

Mr. Colefax said that perhaps the matter might be mentioned again. After consultation with his clients, however, Counsel said that they were anxious to have an immediate judgment, and would withdraw the certificate from the proposed order. His clients were prepared to take an injunction that day. He quite followed what his Lordship had said, and there would simply be an injunction, with costs, including the costs of that application. Mr. Schwann would endorse his brief, which could be produced to the Registrar.

His Lordship made an order accordingly.

The Marconi Patent Case.

On the resumption of the case on Tuesday, January 17th, Mr. Astbury, cross-examining Prof. Boys, said that since the adjournment on the previous Friday, he had had the advantage of reading through witness's evidence. The witness was diametrically opposed on one or two points to both Mr. Duddell and Mr. Clarke.

What might be a transformer in one instrument might not be acting as a transformer in another?—Yes, that was so.

There are a good many things that are obvious now to those who know the calculations that were not obvious before?—The calculations were not made in 1900.

At the present day, is it not a known fact that a single coil, with a closed or open circuit, is indistinguishable electrically, and in fact, from a two-coil instrument? It is well known and obvious?—That is, in fact, so. As a transformer, it is, in fact, identical, but it is not identical in other respects. In so far as its transforming results are concerned, its results are identical.

The whole calculations that have been made to-day had been made before 1900, and were well known to a certain number of scientific men?—They were known to certain scientific men.

Before 1900, you, in particular, had not had any occasion to consider the question of what would be the effect of the one-coil or two-coil transformer between the oscillating closed current and the second radiating circuit?—No. What I was doing I was doing before that. I was not experimenting on this subject during the years 1899 and 1900.

You had not given your attention to that class of problem?—It was only proved in the year 1899.

Supposing that in 1900 Braun's document had been given to you, and you had been asked to read it and to explain from reading it what its object was, you would have found out that he wanted to get a slower vibration?—That was his primary object.

And no other fact would you have found out?—I should have found out that he was using a transformer.

No, you would not, for there is nothing whatever to indicate a transformer in either fig. 1 or fig. 3?—But there is in fig. 2.

But you would not have had fig. 2 before you. There was nothing to show you that he was going to get one result from one different from that he got from another?—No.

If in Braun you had a resistance that was so great as to prevent any vibration or oscillation, then you had the first curve of damping?—Yes, that is all Braun says. It meant that the effective potential was limited. Continuing, Witness said that when they had bigger capacity and slower vibration, one of the causes of damping was less, and in that much Braun was quite right, but with regard to spark-gap, using it without an induction coil, then the statement would not be correct.

Counsel suggested that all that Braun had in his mind was a longer wave, and witness agreed.

Mr. Astbury: One thing in this specification is plain, is it not, that the patentee had no notion of the work *quâ* wave length and frequency that had been done by Marconi?—Witness said that he did not himself know, but he should judge that he did not know that Marconi was using long wave lengths such as they had been discussing. Braun used the word "well-known" aerial, which was not inconsistent with its being a vertical wire of considerable length.

Was there anything in the specification which would have enabled you in 1900 to say what the length of the aerial was?—The only way to find out would have been to ascertain what the well-known aerial was.

Braun was trying what Marconi was doing?—I don't think Braun knew what Marconi was doing.

Anyone would think the object of Marconi's specification was to gear up?—They were all geared up but one.

The object was to get transference of energy in a particular way for a particular purpose?—Yes.

In re-examination, Witness said he could not give any figure as to what was tight or loose coupling. It was really artificial. If you had an absolutely loose coupling, you would not get the "tap-tap-tap" effect, unless there was tuning. The oscillatory circuit was the circuit that was going to determine the wave length.

Mr. Terrell said that was so in any system.

His Lordship: Was that so in a two-circuit apparatus?

Mr. Terrell said they were dealing with a two-circuit apparatus.

His Lordship: The patentee did not say so.

Mr. Terrell: But he gives a picture that shows that it is a two-circuit apparatus. To Witness: You cannot have more oscillations in the oscillating circuit than you have in the primary circuit?—Oh, yes, you can.

Mr. Neville Maskelyne said that he had experimented in wireless telegraphy. His apparatus was a description of Hertzian. It was a coil and battery, with a balloon. There was a wire round the envelope of the balloon and a wire to earth. It was not far wrong to say that the results were about nil. He did not know much then, but his ignorance did not last long, and he took out a patent himself in 1900. He had written on the subject. His view was that tuning and adjustment were the same thing.

In cross-examination, Witness said that he could not produce any book on tuning or an "adjustment coil," as he knew it. He could not produce any book which would show how to make an adjustment coil.

On Wednesday, January 18th, Mr. W. H. Patchell, Mr. Russell S. Wright and Mr. Leslie B. Miller were called for the defence, and spoke to what was commercially known as the transformer.

With the permission of the Judge, Mr. Pletts and Mr. Swinburne were recalled and further questioned with regard to the evidence given for the defence as to Braun's patent.

Mr. Colefax then proceeded to sum up the case for the defence. He submitted that, read in the light of the public knowledge at the time, there was no invention in the patent in question, and if there was not read into the specification that which had been done before, there was no subject matter. The matter turned largely upon what was an auto-transformer, and there, he submitted, the books relied upon by the plaintiffs would not avail them, because all these books were published after the date of Marconi. If it stood there, the plaintiffs' case must fail, and the question was, did it stand there? Looking at the Marconi specification, he submitted that it was beyond question that, in the first instance, it could mean nothing but a two-coil transformer. His objects were things that were inappropriate to anything that had not got two coils. Marconi had written out a specification with very little knowledge of what he did, and had then laid claim to an article. He claimed a transformer; he did not claim a suggested use of it. He claimed the article, and that article was a transformer. Further, a two-coil transformer was the

transformer conveyed. But the patentee, counsel submitted, sought to get a good deal more out of it. That was shown by his starting with "According to my present invention I do something 'specifically.'" What did that mean? Taking a two-coil Tesla, he proceeded to do something with it. More precise language one could not possibly have. His Lordship had said something about ingenuity of result. It was not quite so simple to define the ingenuity of result here. If one looked at the result, counsel thought, it was the ultimate result—namely, the question of wave lengths. That result was only ingenuity in so far as it was a question of degree, and that was obvious because Marconi had himself already gone a long way in that direction. Hertz had a wave length, Lodge had something longer, and Marconi in 1900 got something longer still. That was all this document was concerned with. It gave in precise details what Marconi experimentally had done. That was all they could rely on from start to finish. Marconi did not distinguish at all between the several things that went to make his invention practicable. He submitted, therefore, that there was no subject matter in the plaintiffs' specification, and the defendants had not infringed.

Counsel concluded his speech on Thursday, January 19th, and MR. ASTBURY, summing up the whole case in reply, said that it was unfair to Mr. Marconi to suggest inefficiency, as inefficiency had not been pleaded. He was quite prepared to deal with the question, but he submitted that the defendants could not come in at the eleventh hour and set up a new case. Taking Marconi's specification, there was no need to go into elaborate calculations, for by reference to it they would see that he had calculated everything to a nicety. The length of aerial was to be found there, capacity was calculated to a large number of decimal points, the spark-gap was specified, the particular inductance was given, and even the thickness of wire laid down. He contended that there had been no anticipation. With regard to Braun, which was the principal thing the defendants relied upon as anticipation, he submitted that, taking Braun as he stood, with the knowledge that the scientists had, no effective wireless system could be made to be used commercially. Mr. Marconi had done this, and he asked the Court to say that his invention disclosed in his 1900 patent had not been anticipated, that the defendants had infringed, and the plaintiff was entitled to the relief he asked.

The arguments were concluded on Friday, January 20th, when his Lordship reserved judgment.

MR. ASTBURY intimated that the two other patents upon which the action was brought were merely subsidiary to the 1900 patent, and should his Lordship decide on the 1900 patent one way, the discussion of the others would be mainly academic.

His LORDSHIP said he would deliver his judgment on the first, before dealing with the others.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Simplex Electric Vibrators.

In addition to their motor hair brush—with the motor inside the brush—MESSRS. SIMPLEX CONDUITS, LTD., of 116, Charing Cross Road, W.C., have now provided hair-dressers with an electric vibrator, which appears to have sprung into popularity at once, as quite a considerable income is derived from their use, at a trifling

FIG. 1.—SIMPLEX ELECTRIC VIBRATOR.

cost. The machine is of very light construction, and is supplied with energy by a flexible plug connection to a lampholder, being made for either A.C. or D.C. at any voltage. It gives no fewer than 60 different massage movements, and carries 12 months' guarantee. The illustration shows the professional pattern; a lighter machine is made for private use.

Siemens "High-Tension" Telephone.

MESSRS. SIEMENS BROTHERS & CO., LTD., Caxton House, Westminster, have brought out the instrument here illustrated (fig. 2) for use on lines which run in close proximity to high-pressure circuits, or on the same poles; it is of the bridging type, and is provided with the latest and best means of protecting the instrument and the user from high-pressure discharges. The lines enter through a lightning arrester provided with choking coils, and pass through two high-pressure fuses, which are also shunted by a vacuum arrester; each line then traverses a combined spark gap

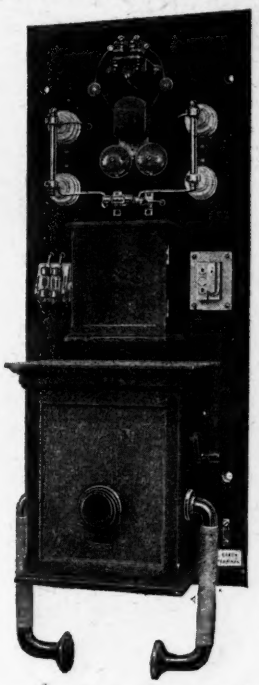


FIG. 2.—SIEMENS "HIGH-TENSION" TELEPHONE.

and vacuum arrester fitted with a heat coil, these arresters being operative at 300 volts, and the heat coil at 0·3 ampere. The receivers are provided with insulated hearing tubes, so that the user, it would seem, cannot possibly get a shock under any conceivable circumstances.

"Efesca" Flat Switch.

The accompanying illustration, fig. 3, shows one of the latest patterns of the H.V. flat tumbler switch introduced by MESSRS. FALK, STADELMANN & CO., LTD., of 83, Farringdon Road, E.C. These are made in a variety of finishes, and with detachable keys, locking covers, earthing terminals, &c., as required. The base is

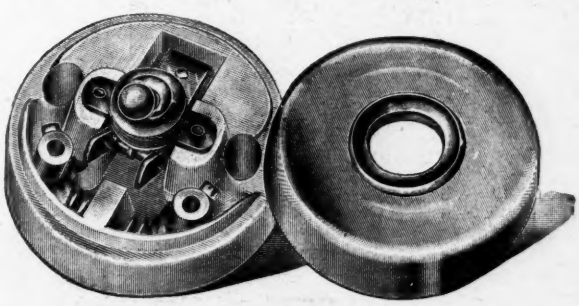


FIG. 3.—"EFESCA" FLAT SWITCH.

2¼ in. in diameter and the projection 1½ in. overall. The switch gives a long double break, and there is a china dividing fillet between the contacts; the terminals are designed for the loop-in system.

"Zoroaster" Cooking Apparatus.

MESSRS. SIMPLEX CONDUITS, LTD., of 116, Charing Cross Road, W.C., are introducing a new system of electric cooking under the registered trade name of "Zoroaster." The heating element used in the "Zoroaster" system consists of a high-resistance alloy, which is mounted on mica in various ways, according to whether it is being applied to roasting, grilling or water boiling. In the water heating apparatus the application of the element differs considerably from what has been usual up to the present. The bottom of the water container is provided with a raised groove in which the element is inserted, so that practically an immersion heater is obtained, which gives nearly 100 per cent. efficiency.

Two types of oven are now being introduced. The larger pattern is built of sheet steel plates with a cast-iron door; the internal dimensions of the oven are 18 in. × 14 in. × 14 in., and the whole of the oven is lagged to a thickness of 2 in., and is, therefore, thoroughly insulated against loss by radiation. The top of the oven is arranged for carrying out the subsidiary operations necessary in the preparation of a meal, other than roasting; it is

finished in bright polished steel and divided into four sections. The two back sections are arranged as water boilers, a copper vessel containing the water being sunk into the top of the oven. A steamer is supplied for use on top of the container, and although only one tier is included, two or three more may be added if necessary. These water boilers are of one gallon and three-quarter gallon capacity respectively, and suitable draw-off taps are brought

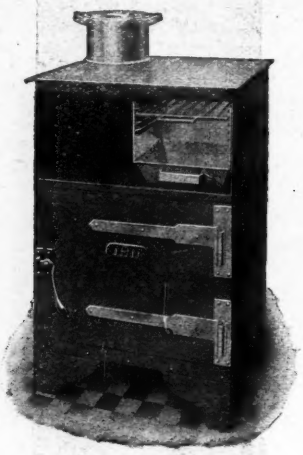


FIG. 4.—"ZOROASTER" OVEN.

out to the front of the oven. The two front sections are also electrically heated, the right-hand side being arranged as a grill, on top of which a kettle may be placed for boiling water; on the left-hand side there is a hot-plate which may be used for frying, and so forth. The chamber underneath the hot-plate may be used for warming dishes. The total loading of this oven is 5 KW.; degrees of heat (3 in the case of the oven) are arranged for in each case, with the exception of the grill.

The oven can cook for 10 persons, and at a recent test carried out in the London showrooms of the company, it was used for preparing a meal for seven persons, consisting of 1 quart of soup, 6 cutlets, 7 lb. sirloin of beef, 2 lb. of potatoes, 2 lb. of sprouts, and 12 mince pies; the meal was prepared in slightly over two hours from

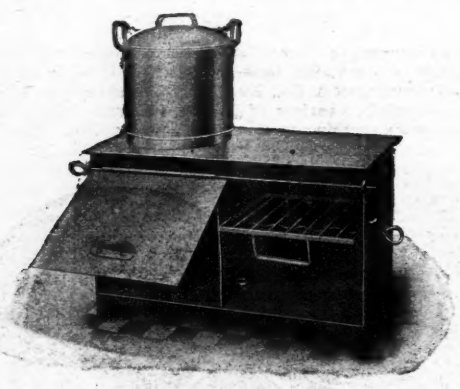


FIG. 5.—"ZOROASTER" COMBINED COOKER.

the starting of the oven, at a consumption of 5·08 units, which works out at something under 1d. per person for the cooking. Three or four additional persons could have been catered for without any great increase in the cost of energy, as the oven was not fully occupied whilst the meat was being roasted.

A second form of oven (fig. 4) is being introduced, of slightly smaller dimensions and made in a cheaper manner, suitable for the middle-class consumer and rated to cook for six persons. The oven is similar, with the exception that the boiling ring and one of the water boilers are omitted.

The combined cooker (fig. 5) which is being introduced consists of a grill and water-boiler similar to that used on the top of the oven, with a chamber for keeping food warm.

Cast-iron Permanent Magnets.

In our issue of September 15th, 1905, we published an article on the manufacture of magnets of cast-iron instead of steel. It is interesting to record that during the past year the manufacture of such magnets has been established in this country, and there are now over 1,500 cast-iron permanent magnets being manufactured every week for certain uses. The magnets are made from ordinary black iron, and after being cast into the required shape, are annealed, cleaned, and afterwards machined, drilled, and tapped to suit the apparatus or machine they are intended for. After this work has been completed and the parts are ready for fitting together, the iron is placed in a special furnace and heated to a predetermined temperature, at which it is kept for a definite time; it is then placed in a chemical bath, which carbonises the iron to the centre. The iron is finally washed in running water, dried, and magnetised in the ordinary way. It might be suggested that this was only a form of case hardening, but the iron, if broken, will be found to be as hard at the centre as it is on the surface. The relative magnetic strengths of the steel and cast-iron magnets are stated to be: steel, 100; cast-iron, 85 as a minimum, and 90 as an average. As regards the magnetic properties, the cast-iron appears to be quite as good as steel, and the curves shown give the results of tests carried out for the manufacturers at the Manchester School of Technology. From exhaustive tests the makers claim that the permeability is as good after 15 months as when first turned out. The most valuable point from the practical side is the

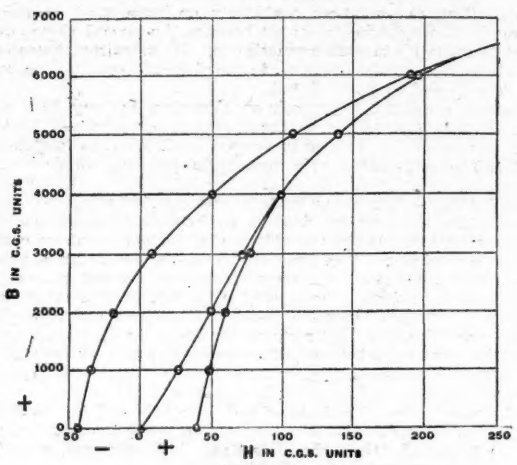


FIG. 6.—HALF-CYCLE OF MAGNETISATION OF BURKS CAST-IRON MAGNET.

saving in cost of manufacture as compared with that of steel, the saving varying from 25 per cent. to 50 per cent. according to the particular design and shape chosen, as the work varies considerably with the different shapes required. In addition, it is possible to cast far more intricate shapes in iron than in steel, and, as an instance of this, it is possible in instrument work for the magnet to be cast with poles and screwing-down lugs all in one piece, thus obviating the expense of grinding both the magnet limb and pole pieces, the drilling and screwing, and, above all, the risk of the poles slipping in transit. We understand that these cast-iron magnets have already been adopted by several instrument makers, and amongst the numerous uses to which they have been put are the manufacture of telephones, relays, meters, magnetos, and small motors and dynamos.

The makers of the cast-iron magnets, MESSRS. F. BURKS & CO., LTD., Prospect Works, Sidmouth Street, Salford, are using large numbers of them in the construction of an electrical massage machine and a small magneto.

"Metalik" Lamps.

MESSRS. G. M. BODDY & CO. inform us that their high-voltage "Metaliks" are now made in the same special way as their vibration-proof low-voltage lamps, so as to be suitable for use in

FIG. 7.—"METALIK" LAMP.

positions where they are exposed to shocks and vibration. The accompanying illustration shows the arrangement of the filaments and supports.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Limerick's Engineer.

With reference to the remarks in your last week's number, I should be obliged if you will allow me to point out one thing that you have forgotten to mention; and that is the fact that the appointment was arranged specially so that no Englishman would be capable of obtaining same. I may say that I am an Irishman myself, and have a good knowledge of the southern counties, and while I do not wish to introduce politics into a paper confined to purely technical questions, I might still touch on the subject by merely saying that in an Irish Roman Catholic city, such as Limerick, no one but a fellow countryman who is a Romanist would be thought suitable. I think if you will inquire further into the matter, you will find that the gentleman appointed is a professor of this faith.

I might also say that the Irish language is as little used in Irish engineering circles as Chinese would be, and I therefore thoroughly agree with your remarks on the subject.

In conclusion, I might point out that happenings like the present one are of daily occurrence in Ireland, and if the proposed Home Rule Bill becomes law, not only will English engineers find it difficult to obtain Irish posts, but also goods of English manufacture will as far as possible be kept out of the country.

Fairplay.

Short-Circuits at Cord-Grips.

Referring to the article in last week's REVIEW, headed "The Bayonet Socket Lampholder," we cannot help thinking that the writer of it in his criticism of the pendant lampholder has probably overlooked, or was not conversant with, our patent "Twin-grip" lampholder. Directly after the serious fire at Messrs. Arding & Hobbs's, the writer gave serious attention to the question of short circuits at cord-grips of lampholders, and the "Twin-grip" was the outcome.

Some thousands of these lampholders have been sold during the past six months, and we have received many letters of cordial approval of them from station engineers and consulting engineers throughout the country. We feel sure that when these holders become universally used no more will be heard of short circuits at cord-grips, and electric lighting will be recognised by the public as the safest illuminant in existence.

Bell Bros. & Co. (London), Ltd.
H. E. EVANS, *Director.*

London, E.C., *January 24th*, 1911.

Electricity in Coal Mines.

Looking at the great changes and achievements that have come as a result of electrical science, we can hardly realise that so much has been accomplished within comparatively few years. Mine owners, agents, and officials, have been quick to recognise this, and have equipped their mines with the best and most modern electric motors and other electrical appliances for coal winning, and to-day steam and compressed air-driven haulages are obsolete. The question is being raised in the electrical profession, and among circles outside of the profession, that the Home Office should appoint a board of examiners in order that the mining charge electricians and motor haulage men may be made to qualify for their positions.

A large proportion of colliery electricians start in the business in some minor capacity, with but little educational preparation for the work; they struggle along by the old haphazard pick-up-as-you-can methods. Of course, there are some competent men among the colliery electricians; I have known several cases where men have been sent by manufacturing firms to remedy certain defects of electrical apparatus, and have failed; the chief electrician coming on the scene has immediately remedied the fault, probably being at an advantage owing to having the running of the piece of machinery. But taking the colliery electricians as a whole, their work and education are far below the standard. The charge-electrician of a coal mine should have a comprehensive knowledge of electricity and be familiar with the erection and maintenance of motors, cables, &c. He should also have mining experience.

The mine motormen plod along under the impression that the subject of electricity is too deep for them, and that they will always be obliged to follow the directions of those who "work with their heads."

They have a vague idea of magnetism, polarity, induction, conductivity, resistance, &c.; they should be able to understand any irregularities in the working of their motors. All that is required of them to-day is to examine the earth-connections of the motor before running and notch the motor up to speed properly.

The question I would ask is, Are these unskilled labourers to be tolerated much longer in fiery mines?

Celt.

The Pay of Station Engineers.

"Pataud's" grammatical defects and metaphors almost warrant comment, but his distribution of the blame for the sweating among station engineers is so quaint as to monopolise attention. Perhaps he, too, is sweated. In what way are the sweated to blame for their low salaries? Does "Pataud" suggest that they prefer to be underpaid? Does he suggest that engineers prefer to underpay their staffs? Clearly, every engineer would rather receive, and pay, higher salaries, but he cannot. Behind him looms committee or board of directors, and still further in the dim background hover ratepayers or shareholders. It is, therefore, futile and unmanly to vent one's spleen upon such helpless instruments as the chiefs; it is characteristic of the immature and hasty judgment of the extreme Radical. Had your correspondent rather more courage, the *nom de plume* would be, indeed, apt. The ratepayers are not so obvious, so he attacks the poor engineer, whom he can see.

Surely it must be patent to all that the sweating results from purely natural causes such as:—(1) The strictly limited number of jobs available; (2) Surplus of candidates; (3) Private incomes (from paternal or other sources) possessed by many young engineers; (4) The fascination (!) for ex-students of running plant.

Despite every opportunity, no complaint of station engineers' ignorance has yet reached us, so "Pataud's" ramblings associating this ignorance with low wages lack substance. A Trade Union, as such, cannot succeed, and salvation, if it is to come, must come through the Institution; but we know that the Institution is a tool of the employers. When will it devote some of its attention to promoting the interests of electrical engineers, besides those of electrical engineering?

Information.

This grievance, to the discussion of which you have again kindly opened your columns, appears as far as ever from being remedied.

Your correspondent "Pataud" has referred to a recent advertisement for a first shift engineer, who must be a fitter, and willing to drive the engines, at 35s. per week.

Presumably the person appointed will be in all but title and remuneration the chief assistant engineer. Just imagine a chief assistant doing, in addition to his own, the duties of charge engineer, fitter, and driver, probably supervising work on mains, and called upon at any hour of the day or night—for 35s. per week.

I submit that the conditions described, which are patent to anyone who has perused your advertisement and "Correspondence" columns from time to time, and which are familiar to many station engineers, cannot but arouse feelings of disgust and shame in any man having the status and good name of his profession at heart, to say nothing of a sense of honour, of humanity, and shall I say, honesty. Who are responsible?

Your correspondent states that the shift engineer is partly to blame. Is the one who takes the job to blame? He may

get less where he is. Must he remain? He is perhaps following the not uncommon course of taking a more responsible position for less pay, with "future prospects." If he accepts, and the "prospects" do not materialise, he will feel like kicking himself, yet should he refrain, while the prospects in due course turn up trumps, he will still feel like kicking. He generally takes the risk.

I would like here to emphasise the perniciousness of this method of wooing and of bestowing promotion. Again, who are responsible? The most direct and obvious answer would appear to be "Those in whose hands these appointments lie." I think that, as circumstances stand, the status and conditions of appointments of charge engineers and chief assistant engineers, depend more upon the managers of our electricity undertakings than upon anybody else, and while I believe a large proportion of them are a fair-minded and upright body of gentlemen of whom any profession might be proud, yet there are others. May I be allowed to indicate those others without being held to impeach the managers as a whole?

I am quite aware that occasionally a manager is "hide bound" by his committee, and perhaps another, under the thumb of a consulting engineer, is told to "do this or do that, and be doeth it." But surely these cases are few, otherwise where do the engineers and managers come in? Is there a remedy?

Before discussing this question, may I ask if it is hopeless to appeal to the sense of honour of our managers? Also may I hope that some of those among them, who undoubtedly do recognise the merits and responsibilities of members of their staff in a fair manner, will give your readers their views?

Scriptor.

METALITE, LTD., AND THE ELECTRICAL TRUST, LTD.

IT having come to our notice that the Electrical Trust, Ltd., of 9 and 10, Pancras Lane, London, E.C., is offering through the post shares in Metalite, Ltd., we think it may perhaps be as well if we remind our readers of our own observations on the prospectus of the latter company, as expressed in the ELECTRICAL REVIEW, July 22nd and 29th, 1910, and our comment upon the statements made at the statutory meeting (ELECTRICAL REVIEW, November 4th, 1910).

As also being of public interest at the present moment in view of the above appeal, we have made it our business to refer to the usual official sources in search of information concerning the course of events between the publication of the prospectus and the circulation of the letter of the Electrical Trust, Ltd. The result of our search is given below.

Our remarks are not in any way concerned with the "Metalite" lamp *per se*, they deal entirely with the financial operations employed in connection with its exploitation.

First it may be as well to explain how the Electrical Trust, Ltd., is interested in the matter, and who and what that Trust may be. Possibly when this information is given it will simplify the matter somewhat.

Let it be understood at once that there is not the remotest connection between the well-known organisation concerned in many tramway and other electrical undertakings and sometimes described as an electrical trust, and the Electrical Trust, Ltd., whose office is at 9 and 10, Pancras Lane, London, E.C. In our search for information, we paid a visit to this address, and on reaching the second floor, stood face to face with a modest-looking door whereon many things were written, showing that this ambitious-sounding organisation shared for its registered offices the same room as a varied assortment of undertakings, thus—

VINCENT & GOODRICH.

{ A. Clarke Vincent, Inc. Acc.
{ R. C. J. Goodrich, Chartered Accountant.

METALITE, LIMITED.

W. T. SAUNDERS & F. G. RIVERS.

BRANTAS SYNDICATE, LTD.
LINCOLN MINERAL CO., LTD.
ELECTRICAL TRUST, LTD.
INTERNATIONAL FILAMENTS, LTD.
GLASS, EARTHENWARE AND ALLIED TRADES ASSOCIATION, LTD.
NONKO (JAVA) RUBBER CO., LTD.

Reference to the "Metalite" prospectus shows that A. C. VINCENT is the secretary of the company. Papers for filing the Electrical Trust, Ltd., in April last were presented by the Glass, Earthenware and Allied Trades Association, and W. T. SAUNDERS, a mining engineer, was one of the subscribers to the Trust's memorandum of association, as was also W. Lee, land agent. The circular now being sent out by the Trust offering the shares is signed "Walton Lee." There were two directors of the Trust—Joseph Metcalfe, who was described on the prospectus of Metalite, Ltd. (of which he is managing director), as "C.E.," and the aforesaid A. C. Vincent. On May 23rd, 1910, an agreement was made between J. Metcalfe, W. Stewart and A. C. Vincent on the one part, and the Electrical Trust on the other part, relating to the sale to it of the vendors' rights to amalgamate certain electrical companies, and to promote such amalgamated companies as a public company, their consideration being £500 in founders' shares. The total nominal capital of the Trust was to be £2,500 in 2,000 ordinary shares of £1 each, and 10,000 founders' shares of 1s. each.

The names of the companies to be amalgamated were not filed, but in due course the Metalite, Ltd., with £500,000 capital, was registered, to take over the businesses, &c., of the Bryant Trading Syndicate, Ltd., and the International Filaments, Ltd., the latter being another of the concerns in the Pancras Lane office. The Metalite prospectus showed that Col. Kinloch, one of its directors, held 500 £1 shares in each, the Bryant and the International Filament concerns, and Mr. J. Metcalfe, "C.E.," held 1,130 in the Bryant and 1,500 in International Filaments. The total issued capital of the Bryant Syndicate was £63,557, and that of International Filaments £20,000.

The prospectus of Metalite, Ltd., advertised for offer 380,000 £1 shares, but the minimum subscription on which the directors were to proceed to allotment was fixed at 150,000 shares. The Electrical Trust, Ltd., with a nominal capital of £2,500, agreed to underwrite the subscription of 150,000 at 9 per cent. commission, payable *in cash*, and there was also payable to the Electrical Trust for preliminary expenses, *in cash*, £18,000.

The purchase money payable was :—

Bryant Trading Syndicate, in cash (or shares) ...	£135,000
International Filaments, " " " ...	85,000

That is £220,000, which, at the option of the vendors, would have been payable as to £100,000 in cash and £120,000 in shares, or the whole amount in shares, subject to a provision relating to working capital. The return registers the allotment down to November 30th last of £326,500. The chairman at the statutory meeting (see ELECTRICAL REVIEW, November 4th, 1910) informed his hearers that 150,000 shares were allotted, and 10s. had been paid on each, which would give cash in the coffers to begin with amounting to £75,000. Remembering this, let us glance further at the returns :—

The *shares* allotted to Bryant Trading Syndicate and International Filaments, Ltd., down to November 30th were ... ... £125,916, £61,239, £97,261 =	£284,416
The shares allotted to the Electrical Trust at November 30th were	£14,925
	£299,341

The reader may deduct this nearly £300,000 in *shares* from the allotment of £326,500, in order to see how far the general public are interested in the undertaking. Among the allotments of shares beyond that £300,000, we find from the registered returns, that the firms of brokers whose names appeared on the prospectus have taken, respectively, 620, 563, and 300 shares, another stockbroker took 300, and two other firms, whose addresses are in

Throgmorton Street and Drapers Gardens respectively, 429 shares each. Messrs. Ashurst, Morris, Crisp & Co., the solicitors appearing on the prospectus of the company, are registered as the holders of 590 shares.

It will be seen that in addition to the £220,000 in cash and shares which was to be the aggregate purchase price, there are in the names of the two vendor companies a further 64,416 shares.

Having thus summarised the position as it appears to us, let us proceed to refer to the circular letter lately sent out by the Electrical Trust, Ltd., offering more shares for subscription.

The Electrical Trust repeats (January 18th, 1911) the prospectus and statutory meeting statements about Metalite, Ltd., being inundated with orders for which the Highbury factory is insufficient, and adds "they will be glad to" deal with this surfeit of orders "on the completion of their new works at Derby, which it is expected will be very shortly."

It will be remembered that in the prospectus, and in the newspaper Press notices relating to it, great emphasis was laid on the fact that additional premises had been arranged for capable of, &c.

It is now six months since the issue of the prospectus. Will the company permit us to satisfy our readers as to the nearness to completion of the new lamp factory?

We now come to a significant paragraph in the Trust's circular letter :—

> As an indication of the vast possibilities in store for the shareholders of Metalite, Ltd., I enclose you an extract from the balance sheets of the German Co. who own the Osram Lamps (which is a parent company) . . . . . You will observe that in both years a dividend of 50 per cent. has been declared. . . . It must be borne in mind that Metalite, Ltd., is a "parent company," negotiations are pending to deal with some of the foreign rights which alone would pay a good dividend.

Would it be altogether surprising if the uninitiated investor imagined from this method of comparison that "Metalite" and "Osram" were both members of the same family, and also that what had happened to the German Osram Co., with an almost free field during several exceptional years, was likely to be repeated in the case of "Metalite"? The general public who invest on the strength of such statements as this are ignorant of the growing competition, and that the exceptional period may be passing. Even the original prospectus reckoned upon a modest 30 per cent., though we still remember that the statutory meeting speech promised that "shareholders would be delighted, at the end of the coming year, with the dividend they would receive."

As the appeal of the Electrical Trust to dispose of Metalite shares refers to the success of other lamp companies, those contemplating purchases will, of course, carefully consider the different circumstances of the different companies.

BUSINESS NOTES.

Buenos Ayres Exhibition Awards.—The result of the appeals against awards made by the various juries in the Railway and Land Transport Exhibition at Buenos Ayres has proved to be entirely in favour of Great Britain. Whereas in the first list the total number of awards to British exhibitors was 222, as compared with 171 to Germany; on the amended list Great Britain has gained seven (229), and Germany lost one (170). Great Britain has gained another Grand Prix, the number of Grand Prix now being increased from 82 to 83, as against 70 gained by Germany.

Cyclone Fans.—We are informed that fans of this type have been adopted by the General Post Office for the next three years, MESSRS. MATTHEWS & YATES, LTD., Swinton, Manchester, having just secured the contract for electric fans during this period. Their fans are also regularly supplied to the Admiralty and M.H. Office of Works.

Book Notices.—*The Institution of Civil Engineers.* Vol. 182 of the *Proceedings* of the Institution of Civil Engineers contains a good deal of matter about electrical work. A paper and discussion on "The Use of Reinforced Concrete on the Wabash Railroad," by Messrs. Matthews and Cunningham, is of value to all engineers, in view of the rapidly increasing use of this material for constructional work. The discussion resulted in a good deal of criticism of the structures described on the astonishing basis (considering that they are in the States) that they are, generally speaking, designed with excessive strength. We have heard of an American contemplating the massive masonry walls on the Bridge of Allan and complaining that we make our handrails unnecessarily strong, but this objection about anything on the other side is quite startling. The volume contains the annual report of the Council, which records continued prosperity for the mother of institutions. The new rules for professional conduct are mentioned. May they always be observed in letter and in spirit! The move across Great George Street will not be long deferred, the foundations of the new building being now in hand. The very important question of the conditions under which tenders are invited, which was brought before the Council by a deputation of the National Federation of Building Trades Employers, is referred to briefly and summarily dismissed. The Council decided to take no action, although it admits grievances of a substantial character. The Council has also given consideration to suggestions that the Institution should permit publication by the Press of its papers and discussions before they appear in the *Proceedings*, but has decided that such a departure would be undesirable. Characteristically, no reason is vouchsafed, but we regret the decision. In these days of rapid development new knowledge of value can hardly be disseminated too soon or too widely. Moreover, we are of opinion that free publication, before they have got stale, would increase the value of the papers to all concerned, and would be an additional inducement to the presentation of valuable and original communications. The best thing in the volume, from our special standpoint, is the excellent "James Forrest" lecture by Sir John Gavey on "Developments in Telegraphy and Telephony," upon which we have already commented. This masterly review of these two branches of engineering science will be appreciated not only by the specialists, but by all engineers who take a general interest in their profession. The lecture closes with a brief reference to wireless telegraphy, and the statement is made by this high authority that speech can already be conveyed 30 or 40 miles without wires; and telegraphic messages have hardly reached their limit at 5,000. Quite a large proportion of the notes which occupy the last part of the volume are devoted to electrical engineering; although they are too short to be of much value in themselves, they give reference in each case to the original source of information.

Annuaire International de l'Acétylène, 1910-11. By R. Granjon and P. Rosemberg. Paris: Bibliothèque de l'Office Central de l'Acétylène. Price 3 fr.—This annual is not a revised edition of last year's issue; it contains a mass of new information on the acetylene industry in all countries, particulars of various organisations interested therein, and a review of recent progress in the application of acetylene to lighting, welding, &c. It appears that there are some 900 towns and villages in the world lighted with acetylene, only 16 of which are British; the United States have 207, France and her Colonies 206, Germany 150 and Italy 125; Austria-Hungary comes next with 40, and the remainder are small figures. Norway and Sweden produce 50,000 tons of carbide a year, and consume 5,500; United States, 45,000 and 32,000; Switzerland, 30,000 and 6,000; Italy, 29,000 and 24,000; France, 28,000 and 25,000; Austria-Hungary, 20,000 and 17,000; Spain and Portugal, 18,000 and 16,000; Canada, 10,000 and 8,000; Germany, 9,000 and 34,884; Great Britain, 2,000 and 14,000. The Argentine consumes 6,000 tons, Belgium 5,500, Brazil 6,500, and Australia 10,000 tons a year. The world's totals are 75 carbide works, 242,600 tons of carbide produced and consumed per annum. An appendix entitled "Practical Notes on Acetylene" gives valuable information on the generation, distribution and utilisation of acetylene, in the course of 90 pages, with numerous illustrations.

Oil Engines, Stationary and Marine. Fifth Edition. Rewritten and enlarged. By W. A. Tookey. London: Percival Marshall and Co. Price 1s. net.—Originally this work was arranged in four parts and an appendix, but it has now been divided into 15 chapters, with an increased number of illustrations and extended appendices, about 30 more pages being added. With the inclusion of the application of oil engines to marine purposes, and the fact that most of the information given is, with the illustrations, new, this little book forms rather a companion work than a reproduction of the original edition in a revised form. Since the original edition was issued, about six years ago, the application of the internal combustion engine to marine purposes has made rapid progress, as will be noticed in comparing the present volume with the author's original works. The amount of useful information contained in Mr. W. A. Tookey's series of small books, so clearly and not too technically described, ensures their appreciation by all engine attendants and students.

The Technical Journal. Vol. IV, No. 1. Liverpool: Northern Publishing Co., Ltd. Price 1s. 2d.—The January issue of this journal (the organ of the Association of Teachers in Technical Institutions, now published under the new title) contains a report of the annual meeting held in London on November 5th, and other work done by the Association; articles on "The Imperial College of Science and Technology," by Barker North; "Ohm and his Law," by Prof. W. W. Haldane Gee; "The Appenticeship System of the British Westinghouse Co.," by A. P. M. Fleming; "Recent American Views on Electrical Engineering Training," by Prof. A. Schwartz; "Notes on the Teaching of Elementary Alternating Currents to Evening Students," by W. H. N. James; "The College Training of an Electrical Engineer," by C. F. Smith; "Third-year Courses," by W. Cramp; and many other items. It is interesting to observe the large preponderance of matters bearing on electrical subjects, or written by electrical men.

"Dictionary of Electrical Engineering." Edited by H. M. Hobart. Two vols. London: Gresham Publishing Co. Price 35s. net.

"*Bulletin* of the Massachusetts Institute of Technology." December, 1910. Vol. 46, No. 1. Boston: The Institute.

"The Metric System of Weights and Measures." By Charles MacDonald. Glasgow: The Royal Philosophical Society.

"Report of Debate on the Metric System in the House of Representatives of Australia, August 4th, 1910." London: The Decimal Association. Gratis.

"*Journal* of the American Society of Mechanical Engineers." January, 1911. Baltimore: The Offices of the Society. Price $1.

"Architects' and Builders' Pocket Price Book" and "Architects' and Builders' Pocket Book.—Memoranda Section." 1911. London: E. and F. N. Spon, Ltd. Price 2s. 6d. net each.

"Quarterly *Bulletin* of the American Institute of Architects." Vol. XI, No. 3. October, 1910. Washington: The Octagon.

"*Journal* of the Franklin Institute." Vol. CLXXI, No. 1. January, 1911. Philadelphia: The Institute. Price 50 cents.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXX, No. 1. January, 1911. New York: The Institute. Price $1.00.

"*Proceedings* of the Physical Society of London." December 15th, 1910. London: *Electrician* Printing and Publishing Co. Price 4s. net.

"Depreciation of Works and Machinery: Its Causes, Effects and Treatment." By Henry Sherly Price. London: From the Author, 46, Watling Street, E.C.

"Three-Phase Transmission." By William Brew. 1911. London: Crosby Lockwood & Son. Price 7s. 6d. net.

The Graetzin Metal Filament Lamp.—Many of our readers may be familiar with the name of the Graetzin light and gas burners, which are known all over the world, and it need cause no surprise that Messrs. Ehrich & Graetz should follow in the footsteps of Pintsch and Auer and turn their attention to the production of an electric lamp. Their experiments have lasted over several years, and have resulted in the Graetzin metal-filament lamp, the sole agency for which in this country is in the hands of Messrs. Krupka & Jacoby, of 11, Queen Victoria Street, E.C. Before taking up the Graetzin lamp, Messrs. Krupka & Jacoby had first to be assured of its qualities and efficiency; having satisfied themselves on these points, they made the necessary arrangements for placing it on the market here. They have submitted to us a table of tests made on the lamps by the Physikalisch-Technische Reichsanstalt, of Charlottenburg, which were carried out on nine lamps up to 4,000 hours without a single breakage; 6,000 hours' life has now been reached, and we understand that some of the lamps are still burning. The lamp is well made, and the filament is supported in such a manner as to minimise the probability of breakage. The lamps tested were of about 26 C.P. at 115-117 volts D.C., and had an initial efficiency averaging 1·157 watts per mean hefner candle measured at right angles to the axis of the lamp. After 1,000 hours the average C.P. was 23·54, and the consumption 1·27 watts per hefner, and after 2,500 hours the candle-power was still over 20, the consumption being 1·44 watts per hefner. Even after 4,000 hours, the candle-power averaged nearly 18 hefners. It will be seen, therefore, that the Graetzin metallic-filament lamps are of excellent quality. The special lines are the high candle-power lamps of 100 to 1,000 C.P., for public lighting. Large stocks will be kept in London, and prompt deliveries are guaranteed.

Arc Lamp Patent Revoked.—In the *London Gazette* for January 20th, the Comptroller-General gives notice under the Patents and Designs Act, 1907, surrender of Letters Patent under Sec. 26 (3), that an order has been made revoking patent, No. 18,328, of 1909, for "Improvements in flame arc electric lamps" (dated August 11th, 1908) granted to Siemens-Schuckertwerke, G.m.b.H.

Bankruptcy Proceedings.—JOHN FILMER DAVIE, electrician, late of 10, Great Castle Street, Oxford Street, W.—An application for an order of discharge was made on Wednesday last week to Mr. Registrar Linklater at the London Bankruptcy Court. Mr. E. Leadam Hough, Senior Official Receiver, reported that the applicant failed in April, 1910, the only liability being a sum of £156, due to the petitioning creditor. The assets had realised £15. The bankrupt had stated that he had never been in business on his own account, but had for years past been in employment. He attributed his insolvency to his having in 1906, with his then employer (who had given him an option, which was never exercised, of becoming a partner in his business, but who was now a bankrupt), become joint lessee of premises in Great Castle Street, belonging to the petitioning creditor, whose claim represented arrears of rent of those premises, plus costs. When the bankrupt incurred that liability he had no means other than his salary of £200 a year, which was sufficient only for his own wants. On the ground of insufficiency of assets to equal 10s. in the £ on the amount of the unsecured liabilities, the discharge was suspended for two years. Order entered accordingly.

J. W. BARNETT (trading as Barnett & Hyde), electrical engineer, 25, Waterloo Road, Burslem.—Receiving order made January 16th on a creditor's petition. First meeting January 30th; public examination, February 15th.

W. G. EVERINGHAM, electrician, 37, Auckland Road, Ilford.—First and final dividend of 5¾d. in the £, payable January 24th, at 14, Bedford Row, W.C.

HENRY JAMES DALE, electrician, 15, New Oxford Street, W.C., lately carrying on business at 166, Pentonville Road, N.—Receiving order made January 16th on debtor's own petition. First meeting, January 30th; public examination, March 1st; both at Carey Street, W.C.

ROBERT BROWN, company director, Parliament Chambers, Great Smith Street, Westminster.—At a sitting of the London Bankruptcy Court, held on Wednesday last week, Mr. Registrar Linklater approved a scheme of arrangement under this failure. The debtor, from September, 1904, to December, 1908, acted as manager of the Traction Corporation, Ltd., and he attributed his failure to his liability for the costs of an action unsuccessfully brought by himself and the company against a former employé in connection with the alleged infringement, or threatened infringement, of a patent; also to his liability as surety for moneys found or borrowed for the company. For some years before the failure the debtor had taken out four patents in connection with what he considered an improved system of electric traction for tramways; he had charged the patents to secure loans amounting to £4,050, made to the before-mentioned company, and placed no value on the equities. Under the scheme of arrangement a composition of 7s. 6d. in the £ will be paid on liabilities of £2,164. Mr. Simpson appeared for the debtor, and stated that the money required for the composition and the costs of the proceedings had been lodged with the Official Receiver. His Honour approved the scheme, and discharged the receiving order.

CHARLES HELLYER PEARSON (trading as Pearson & Co. and as the B.O.A. Engineering Co.) 51A, Mosley Street, Stockton Street, Manchester, and 4, Manchester Road, Hyde, Cheshire, electrical engineer, &c.—This debtor attended at the Court House, Quay Street, Manchester, last week for his public examination. The statement of affairs showed liabilities to unsecured creditors £2,726, and assets estimated to produce £993. It was elicited by the Assistant Official Receiver that the debtor when he first commenced business in October, 1902, had a cash capital of £50. In 1907 he added the business of a decorator, and in the following year that of a plumber. In April, 1900, he acquired an electrical switch business in Hulme, the consideration being £100, this being money previously advanced to the firm, which was known as the B.O.A. (Best of All) Engineering Co. Debtor reckoned that he only got £30 worth of stock and machinery for his £100. Questioned about his deficiency, debtor said he had lost over £1,000 in the B.O.A. Engineering Co. There had been a great deal of experimental work carried on since he acquired the undertaking, and a number of patents secured. Debtor expressed the opinion that had he been successful in bringing about the sale of one of his patent switches he would have made good all the money expended at the B.O.A. Works, and more. In addition to the £1,029 lost on the B.O.A. undertaking, he calculated that his losses on electrical contracts amounted to £580. In one case, where the loss was £340, the cause was attributable to a mistake made by an employé of his. Bad debts he put down at £154, and depreciation of stock and plant at £418. Debtor admitted that some goods, including white lead, barrels of oil varnish, &c., were removed from the Stockton Street Works to Rusholme by his orders just before the receiving order was made. Asked to explain, debtor said that it was because the business of the painters and plumbers was clashing with that of the engineering section. In reply to other questions, debtor said that at December, 1907, he had an estimated surplus of £847 of assets over liabilities. Apart from the B.O.A. Engineering business, he reckoned that the net profits on the other branches of his business from January 1st, 1908, to the date of the receiving order amounted to £2,660. Debtor explained how he came to part with a motor-car he had to a friend. The friend had lent him £70, and it was agreed that he should have the motor-car in satisfaction of his claim. The case was ordered to stand adjourned.

Trade Announcements.—THE WESTERN ELECTRIC CO., LTD., have now opened branch offices in the following towns, where their representatives will attend to inquiries for cables, telephones and electrical supplies in the surrounding districts:—Birmingham, King's Court, 115, Colmore Row; Leeds, Standard Buildings, City Square; Cardiff, 2, Bank Buildings.

MESSRS. TROUP, CURTIS & CO., electrical and general engineers, of Victoria Dock Road, London, E., have opened a new branch establishment at West Bute Street (Docks), Cardiff, to deal with increasing electrical business in the ports of Barry, Newport and Swansea, and the colliery district of South Wales.

MR. A. WHITTAKER, consulting electrical and kinematograph engineer, has removed from South Bank to Magdalen Street, North Ormsby, Middlesbrough.

MESSRS. BROOK, HIRST & CO., LTD., electrical switchgear manufacturers, Northgate Electrical Works, Chester, have opened a London office at 25, Victoria Street, Westminster. Telephone number, 5665 Westminster.

Dissolutions and Liquidations.—ROSE'S AUTOMATIC TARGET SYNDICATE, LTD.—A meeting will shortly be held at 13-14, Abchurch Lane, E.C., to hear an account of the winding up from the liquidator, Mr. H. H. Thompson.

WESTMINSTER TOOL AND ELECTRIC CO., LTD.—A meeting is to be held at 9, Bridge Street, Westminster, on February 20th, to hear an account of the winding up from the liquidator, Mr. F. W. White.

TELEPHOS, LTD.—This company is winding up voluntarily, with Mr. H. S. Ketteridge, Gresham House, E.C., as liquidator. A meeting of creditors is called for February 6th.

Catalogues and Calendars.—THE UNION ELECTRIC CO., LTD., Park Street, Southwark, London, S.E.—Advance copy of a new booklet containing "Night Pictures," showing a number of excellent half-tone reproductions from untouched photographs of night scenes where "Excello" flame arc lamps are responsible for the illumination. Exterior views show the London Pavilion, Piccadilly Circus, Frascati's, the Empire Theatre, Savoy Hotel and other buildings, and a torchlight tattoo at Chatham. Copies of the booklet which is artistically got up can be obtained by any reader who makes application to the company.

MESSRS. MAWDSLEY'S, LTD., of Zone Works, Dursley, have issued a charming wall calendar for 1911, the feature of which is a charming colour-print of Albert Lynch's "Vera."

MESSRS. ELECTRIC CONTROL, LTD., 177, Reid Street, Bridgeton, Glasgow.—New catalogue of various "Empire" electric control apparatus, comprising a number of leaflets brought together in a binding cover, with arrangement for substituting or adding new lists as issued. The contents illustrated, briefly described and plainly priced, include automatic starters, pressure regulators, romote control switches, tappet switches, solenoid switches, lift controllers, lift brakes and accessories, snap-switches, and hand starters.

LIGHTING and POWER NOTES.

Afghanistan.—It is stated that Mr. C. Bonnett, of Messrs. F. and C. Osler & Co., Ltd., Bombay, has just returned from Kabul, having obtained for his firm a contract for the erection of a hydro-electric plant at Kabul. Power is to be taken from the Salang River, electric energy being generated at 44,000 volts and transmitted to Kabul, a distance of 40 odd miles, where it is to be transformed down and used for the electric driving of the Amir's gun shops, the leather factory and woollen mills. Later on it is intended to use electricity at night-time for lighting the houses of the leading residents, and also the principal streets of Kabul.

Bexhill.—A statement of the revenue account of the Corporation electricity undertaking for the half-year ended September, submitted at the Council meeting on Monday, shows that the income amounted to £4,869, of which £1,649 was from public lighting. The expenditure was £5,179, leaving a deficit of £310, compared with previous losses for similar periods of £111 and £192. Interest on loans accounts for £910, and depreciation for £1,454.

Budleigh Salterton.—The U.D.C. has passed a resolution formally approving of the application of Messrs. Purves and Co., of Exeter, for a prov. order for E.L.

Chile.—The electricity plant established in Santiago, Chile, by the A.E.G., has, by the erection of sub-stations, recently been increased to the extent of about 11,000 KW. At the present time the plant at the power house comprises steam dynamos and transformers of a capacity of approximately 15,000 KW. It was in 1897 that a number of English and German banking houses, in conjunction with the A.E.G., secured a concession for the supply of electricity for lighting and power purposes, and for the construction and working of an electric tramway in the city of Santiago; the Chilian Electric Tramways and Light Co., Ltd., with headquarters in London, was formed to exploit the concession. It was at first proposed to put down a plant to utilise certain falls on the River Maipo, about 14 miles from Santiago, but in order to fulfil the conditions of the concession with regard to time, it was resolved to establish a steam-operated generating station in the city itself, leaving the realisation of the water-power station until a later date. A continuous-current generating station of 3,000 H.P. was first arranged for, this comprising three 1,000-H.P. steam engines coupled to dynamos of 670-KW. capacity, but during the period of construction a further set (2,000-H.P. engine and dynamo) was put in, bringing the total capacity up to 3,350 KW. The steam-raising plant comprises seven water-tube boilers, each having 320 sq. metres of heating surface, while for load-equalising purposes a 1,000-KW. battery of accumulators was also installed. The station supplies continuous current at 2 × 200 volts for lighting and power purposes, and at 550 volts for feeding the tramway system. The station was completed in 1900, and by 1908 it became evident that some further provision must be made in order to meet the growing demand. An extension of the existing station not being deemed feasible, the question of utilising water power was again considered. Eventually it was decided not to establish another station, but to enter into a contract with the Deutsche Uberseeische Elec. Ges. to take power from the generating station which this company had established near Santiago to utilise the water power of the River Maipo. The current supplied is alternating, and is received in the city at 12,000 volts, and in order to convert it to continuous current at the desired voltage, three sub-stations have recently been established in Santiago. The plant in these, which was also supplied by the A.E.G., consists of A.C. synchronous motors (11,500 volts) coupled to special D.C. dynamos of either 500 or 1,000-KW. capacity. The machines can be employed for the feeding of either the tramway or the lighting mains. Altogether nine sets of 1,000 KW., and four of 500 KW. have been installed.

China.—During the year 1909 contracts were given out for new electric light installations at Chungking, Chengtu, Changsha, Nanking, Ningpo. Indeed there may be said to be an electric lighting project in every city in China; the only difficulty is to find funds for carrying such projects into execution. Almost all contracts, says Mr. W. P. Ker, H.M. Commercial Attaché at Peking, require to be financed by the contractors, and British firms, finding British manufacturers unwilling to supply plant except for cash down, have sometimes co-operated with German firms, the latter arranging the finance in return for being allowed to participate.

Clitheroe.—In connection with the Clitheroe Electric Lighting Order (1904) which the B. of T. is declining to renew unless steps are taken to provide the town with electricity, the T.C. has now appointed a deputation to obtain information from other towns of similar size where municipal electrical undertakings are in operation, and to visit such towns, if necessary, and report to the Committee.

Continental Notes.—HUNGARY.—Intending to exercise its right to buy back the stations and plant of the two existing electric light companies on the expiry, shortly, of the first period named in the concessions, the Budapesth T.C., following the example of that of Vienna, has decided to build a municipal generating station of its own on generous lines. Competitive plans for this station are being invited from leading Austro-Hungarian electric construction companies. The new plant will consist of three units of 5,000 KW. each, or 7,200 K.V.A., two of which are to be actually installed. The boiler house is so planned that the third steam unit will have a capacity of 10,000 K.V.A. The condensation water will be taken from the Danube, while the coal will be supplied by ship and railway.—*Elektrotechnische Zeitschrift.*

Doncaster.—The T.C. has decided to apply to the L.G.B. for a loan of £12,000 for additional plant at the electricity works, in view of the contemplated and possible tramway extensions.

Dorking.—The U.D.C. has decided, subject to the sanction of the B. of T., to extend the E.L. mains to Boxlands, at a cost of £600, and to the Reigate Road, which is in the area of the R.D.C.

Edinburgh.—The town clerk has received a letter from the Secretary for Scotland intimating his consent to the borrowing by the Corporation of a further sum of £75,000 for the execution of capital works under the Edinburgh Electric Lighting Order, 1891, raising the total sum authorised to be borrowed for that purpose to £1,110,000.

Extensive alterations are being made at Holyrood Palace in view of the visit of the King and Queen after the Coronation, and the electric light is being installed.

Exeter.—Mr. H. D. Munro, electrical engineer to the Corporation, reports that for the second half-year of 1910 the lighting revenue has been maintained, the reduction due to the extending use of metal lamps being balanced by the increase, due to new consumers. The reduced charges for power have decreased the revenue from old consumers by £102. There is a decrease for the half-year in receipts from tramways of £147, due to the reduction in the rate charged, and a further decrease of £220 due to the check on the drivers furnished by the meters on the cars. The reductions were all foreseen, and are less than were anticipated, whilst the new revenue from power amounting to £108 is a satisfactory feature.

Fife.—Very soon the power station of the Fife Electric Lighting Co. at Townhill, Dunfermline, will be generating electricity to supply an area of 200 sq. miles. The scheme will shortly be before the B. of T., but as the whole of the Fifeshire local authorities have assented to the order, the appeal to the Board has become a formality. At Buckhaven T.C. on Friday night, Mr. Balfour, the promoter, explained that Dunfermline, after consulting many experts, realised that it could not make electricity so cheaply as the company. The price would be regulated by circumstances, but he thought the general rate would be 5d. per unit for private users, and about 3d. for street lighting, while the price for large consumers would be at still lower rates. A cable 22 miles long would be laid from Townhill to Lochgelly and over the hills, though the towns *en route* to Leven, while another cable would be run from Leven along the coast to Inverkeithing and Rosyth, and back to Townhill, cross cables also linking the whole system. They were to pass through Kirkcaldy, and might at some future date offer to supply the Corporation there. By Midsummer they were to supply the power for the Wemyss cars. After Mr. Balfour's statement, Buckhaven T.C. decided to join the other burghs in concurring in the order, and Mr Balfour was thanked for his satisfactory explanation.

Glasgow.—Negotiations have taken place between the chief engineer of the electricity department and the inspector of lighting, as to a proposed alteration and improvement on the present system of electric lighting in the streets of the city, and the sub-committee in charge has remitted the whole question to a special committee for consideration and report.

Greenock.—Plans have been approved for an addition to the Corporation electricity works at Dellingburn Street. Meantime only one turbo-generator will be installed, but floor space will be provided for two additional sets. Additions to the generating plant have been rendered necessary by the largely increased demand.

Sometime ago the Secretary for Scotland objected to the Corporation applying £2,000 of the surplus of £3,000 at the credit of the electricity department to the reduction of burgh rates, and the remainder to the reserve fund. Negotiations have taken place between the Corporation and the Scottish Office, with the result that the sum paid into the reserve fund is to be increased to £1,500.

Hastings.—On Tuesday an inquiry was held by Mr. M. K. North, L.G.B., into the application of the Corporation to borrow £2,083 for the extension of electric mains, &c. There was strong opposition by the Hastings Gas Co. The borough electrical engineer gave evidence in support of the proposed extensions, and was subjected to considerable cross-examination. The present loan

was required for short extensions to supply prospective customers. A loan for converting gas lamps was recently refused, and some of this work had since been carried out by means of money from the current rates.

Holmes Chapel.—The Cheshire C.C. has decided to extend the electric light installation to the new portions of the Agricultural College at a cost of about £150.

Hornsey.—A letter has been received from the L.G.B. sanctioning the borrowing of £2,000 for mains, and £4,000 for services. Consent has been given to the construction by the Metropolitan Electric Tramways, Ltd., of a new cross-over road near Highgate Archway.

Ilkley (Yorks.).—An electrical engineer is now preparing a scheme for the electric lighting of the town, which will be submitted to the District Council in due course.

Liverpool.—The cost of the electrical department of the Corporation in wages and salaries is given in a return presented by the resident electrical engineer (Mr. A. Clough) for 1909-10. In 1909 the expenditure was £9,644 against £10,325 in 1910, the chief increases being from £3,265 to £3,633 for assistant engineers, inspectors, &c., and from £2,208 to £2,459 for clerks. The salaries of the consulting engineer (£1,000), resident engineer (£900), and the deputy engineer (£600) remain unchanged, while the salary of the chief clerk has been increased from £375 to £400. The work of the department does not permit of any revision or reduction of the staff.

London.—Stepney.—In regard to the decision of the L.C.C. in 1907 that the period of 42 years, which up to that time had been allowed for the repayment of loans for electricity supply purposes, should be shortened, the Finance Committee of the B.C. has reported that of the £265,096 sanctioned by the L.C.C. for a period of 42 years, £237,096 only had been borrowed. The unexercised sanctions amounting to £28,000 are to be returned to the L.C.C. for cancellation subject to the central body agreeing, *inter alia*, to sanction loans for mains in advance of expenditure.

Marylebone.—In regard to the Metropolitan District Railway Bill which is to come before Parliament in the ensuing session, objection has been taken to the measure by the Electric Supply Committee, in so far as the absolute repeal proposed of three sections of its existing Act might put the company in the position of being able to supply current which the Council would expect to supply. A petition is to be lodged.

Islington.—The B.C. having unanimously asked the members of the E.L. Committee who recently resigned to reconsider their decision, the 11 members in question have now withdrawn their resignations.

Long Ashton.—The R.D.C. has decided to oppose the application of Messrs. Christy Bros. for a prov. order for E.L., as only a portion of the district is proposed to be supplied.

Luton.—The T.C. has received from the L.G.B. sanction to a loan of £2,396 for a boiler, economiser, &c., at the electricity works.

Perth.—It has been reported that the Corporation has considered a scheme whereby the water of Lochgarry, on the border line of Inverness and Perth shires, along with Loch Tay, could be used in a hydro-electric plant for the town supply; surveys are stated to have been made. Inquiries by our representative have failed to confirm the reports, and gentlemen interviewed have stated that the costly nature of such a scheme would make it prohibitive.

Radcliffe.—The D.C. has made an application to the Bury Corporation with regard to the supply of electricity in bulk. A special committee has been appointed to meet and confer with the Radcliffe representatives on the question.

Southend.—The T.C. has decided to substitute electricity for gas for lighting the Pier, at an estimated cost of £504. The L.G.B. has sanctioned a loan of £16,100 for mains and services, &c.

The T.C. has decided for a year to supply current used for the display of electrical fittings to local electricians, at a minimum charge of £10 per annum for every 10 amperes or part of 10 amperes for the maximum demand, and 1d. per unit for energy in excess of that amount.

Sutton (Surrey).—At a meeting of the U.D.C. on the 18th inst., the question of the town lighting was considered. The Lighting Sub-Committee reported having received tenders from the South Metropolitan Electric Tramways and Lighting Co., and the Gas Co. as follows:—The former offered to light the existing public electric lamps or any further number required at £2 10s., £3 1s., £4, £5 10s., £9 10s., or £15 per lamp, according to the standard of lighting required, for a period of five years; the Gas Co. offered to light the existing gas lamps at £3 3s., £5 10s., £8 or £11 per lamp for the same period. But this tender was subject to the company replacing the present lanterns with globe lamps within six months of the contract being entered into. Both tenders were accepted, and in the discussion it was stated that as regards electric lighting, the whole of the side streets would be lit with 100-c.p. lamps instead of 64-c.p. lamps as at present, that the arc lamps would be of an improved type, giving a better light at a cost of £13 per annum each, as compared with £17 10s. each previously, and that the standards and lanterns would be improved. The result would be that by the two contracts the town would save £222 a year, getting at the same time increased brilliancy in light from both companies. For some time past both companies have had lamps specially erected for the purpose of showing the advantages of electricity and gas for lighting.

Swindon.—The T.C. has approved of a scheme for extending the generating plant at the electricity works. The estimated cost is £10,432.

Taunton.—The T.C. has decided to reduce the charges for motor hire as under:—½ H.P. from 10s. to 7s. 6d.; 1 H.P. from 15s. to 10s.; 2 H.P. from 15s. 6d. to 12s. 6d.; 4 H.P. from 20s. to 15s.; 6 H.P. from 30s. to 20s.

Trowbridge.—Messrs. Edwards and Armstrong, the promoters of the electricity supply at Chippenham, have received such support for the scheme at Trowbridge, that they intend to proceed with the work. The firm are seeking a suitable building for use as a generating station.

West Ham.—Terms have been agreed to whereby Messrs. Morris, Streimer & Co. will take the whole of their power and lighting from the Corporation for a period of seven years. The agreement was made in connection with an extension of power and lighting for the works.

Willesden.—The Electricity Committee in its report for the year ended March 31st, 1910, suggested that the Gas Light and Coke Co. and the Council's electricity department should be invited, for the purpose of comparison, to tender for the lighting of certain areas to the same specification as regards illuminating power, maintenance, &c., with a view of determining the respective merits and costs of both bethods of lighting. The suggestion was considered by the Works and General Purposes Committee, which has decided that facilities be afforded to the gas company to fix six gas lamp standards in Cavendish Road with certain improved gas burners in substitution for the existing burners.

TRAMWAY and RAILWAY NOTES.

Continental Notes.—Italy.—Electrical working on the Mont Cenis line, as also upon the Giovi line will, according to the *Frankfurt Zeitung*, be shortly undertaken. The current will be drawn for the former from the Chiomonte generating station belonging to the city of Turin, and for the latter from the Government station near Genoa. The Dinamo Co. will supply the current for the working of the Varesini railways, when the steam power station at Tarnavento will cease operations. The electrification of the 90 km. track from Naples to Avellino, as well as that of various South Italian local lines, will follow in due course.—*Electrotechnische Zeitschrift.*

Coventry.—On the advice of Mr. A. Baker, of the Birmingham Corporation Tramways, who was retained as expert, the T.C. has agreed to give the tramways company notice requiring it to sell its undertaking to the town.

Edinburgh.—A meeting has taken place between a sub-committee of Midlothian County Council and the promoters of the proposed tramway to Colinton, in regard to the suggested extension of the tramway beyond Colinton to Juniper Green. The sub-committee will prepare a report.

Glasgow.—Opinion of counsel has been taken by the T.C.'s Tramway Committee in connection with its objection to be charged full assessments under certain municipal departments. Counsel are of opinion that the expression "railways" in Sec. 36 of the City of Glasgow Act, 1891, includes the Glasgow tramways, the lines of which are, therefore, only assessable *quoad* one-fourth of the amount entered as the yearly rent in the valuation roll, and they agreed to recommend the Corporation to proceed with the appeal against the said assessments. The Committee recommend that the appeal be gone on with.

Halifax.—In the forthcoming Parliamentary Bill of the Corporation provision is to be made for the borrowing of £6,000 for tram-top covers and £48,500 for street widenings for trackless trams and motor-omnibuses, and for constructing a tramway along Southgate.

Huddersfield.—The Corporation has decided to consider the question of the proposed extension of the tramways to Newmill and Jackson Bridge when next the Corporation promotes a Bill.

Irlam.—It was thought that with the rapid industrial development of the district of Irlam, where extensive iron and steel works are being established, the Salford Corporation would be inclined to extend its tramways from Peel Green to Irlam—a distance of about 4 miles—but the town clerk has written intimating that after inspecting the route, the Salford Tramways Committee considers the present an inopportune time for extending the tramways to Irlam.

Japan.—It is announced from Yokohama that the municipal authorities of that town have decided on the construction of a number of new lines of electric tramways.

Kirkcaldy.—Work in connection with the tramways to Dysart has been completed, and the first car, containing members of the T.C., passed over the line last week.

Lancaster.—A Committee has been appointed to inquire into the cost of adding top-deck covers, and will visit towns where they are in use. During December the number of passengers carried was 101,268 against 104,637 last year, the receipts being £383 against £369.

Liverpool.—On behalf of the employés at the Lambeth Road works of the Corporation tramways department, a deputation waited upon the Committee on the 20th inst., respecting alleged grievances. The Brassfounders' Society men complained that recent discharges were due to the overhead equipment of electric cars being sent out to be manufactured; that their members had not had a chance of competing with other firms for those jobs; and that the article bought was inferior to that produced at the Lambeth Road works. The coachmakers and the wood-cutting machinists made representations regarding the basis of wages. The electrical trade unionists alleged that the Corporation were not paying the recognised rate, 9d. per hour, to members in the works; and the engineers complained that preference was apparently given to non-society men, an instance being quoted. The Committee assured the deputation that the matters raised by it would be considered. Sir Chas. Petrie (chairman) said the Committee had always shown its practical desire to act up to the standing order of the Council respecting the standard rate of wages, and it should adhere to it.

London.—The latest addition to the equipment of the L.C.C. Fire Brigade is an electric motor fire engine. It is of the Cedes type, built by the Austrian-Daimler Motor Co., of London and Neustadt, Austria; the electric motors are built up in the hubs of the road wheels and the battery of accumulators is carried under a bonnet in the space usually occupied by the petrol engine.

Padiham.—The B. of T. has been in communication with the U.D.C. respecting the Blackburn, &c., light railways, and the local authority has decided, "having regard to the delay which has already taken place, and believing that the scheme is altogether contrary to the best interests of the Council, to protest against any further amendment or delay, and to submit that the Order should not be confirmed by the Board."

Potteries.—The B. of T. has notified the Stoke T.C. of its intention to allow the Potteries Electric Traction Co. to abandon certain proposed sections of tramways. The company's proposed abandonment was strongly opposed by the T.C. last November.

Rossendale Valley.—Another length of electric tramway has just been opened in the Rossendale Valley, this being the new branch from Waterfoot to Water. The branch joins the main Rawtenstall to Bacup tramway at Waterfoot, and proceeds through Lumb and Whitewell Bottom to Water, a distance of 3 miles.

Ripley (Derbyshire).—Representatives of the local D.C. have been shown over the route of the proposed tramways to be constructed by the Notts. and Derbyshire Tramways Co., and have asked for fuller particulars from the company. The Council had decided to oppose the company's Bill.

TELEGRAPH and TELEPHONE NOTES.

Austria.—A recently published order states that Austrian merchant ships making voyages by way of Gibraltar or Aden must be equipped with adequate wireless appliances capable of transmitting or receiving messages over a radius of 100 sea miles, and communicating with any system. The order comes into force in a year from its date.

Arbroath.—The laying of the telephone cables underground, a work which is expected to last several months, is now proceeding. The multiplicity of the wires overhead has rendered the transference desirable.

Automatic Telephones.—Rumours that the Post Office authorities were introducing automatic telephones, which have agitated the daily Press for some time, have been emphatically contradicted by the Post Office. The new Post Office buildings in Newgate Street are being equipped with an automatic system as an experiment, but the impracticability of the general adoption of any such system in London is fully realised by the authorities.

Germany.—The Cologne Telegraph Exchange is to be equipped with a completely new plant early in the current year, its present capacity being wholly insufficient for the 11,800 connections now in existence. For technical and economic reasons the future connections will be divided into two groups, each group being capable of including about 10,000 connections. The groups will be differentiated by the letters A and B. The new equipment will afford the possibility of doing away with the numbers above 9999, and thus remove the chance of error which the five figures involve. The Deutsche Telegraphen G.m.b.H., of Berlin, will supply the equipment on the C.B. system.

Post Office Telephones.—In order to increase the rapidity of operation at busy times, in a new exchange which the Post Office is erecting in the Avenue district, provision will be made for receiving calls on three adjoining sections simultaneously, thus trebling their chance of receiving immediate attention.

Russia.—Steps are to be taken towards the establishment of a range of wireless telegraph stations in the Far East, on the Arctic coast, White Sea, Lake Ladoga, Baltic Sea, Sea of Azov, Black Sea, and Caspian Sea. Arrangements are to be made for the erection of the following five stations during 1911:—Two in the Far East, and one each at Reval, Taganrog, and Novorossisk.—*Board of Trade Journal.*

Sweden.—The Great Northern Telegraph Co., Ltd., notify that on and after February 1st the rate to Sweden will be reduced to 2½d. per word.

Telephone Rates.—In view of the agitation which is being fomented by various public bodies with regard to the rates to be charged by the Post Office after the transfer of the National Telephone Co.'s system, the P.M.G. has announced that while he wishes to provide a telephone service at the lowest rates financially sound and equitable to all users, it is impossible to consider the revision of rates until the purchase price of the company's plant has been determined by arbitration. He has not, therefore, contemplated any alterations at the end of this year, and the movement in question has been based upon a misapprehension.

Wireless Telegraphy.—A Reuter telegram states that Lieutenant Beck, of the United States Signal Service, has been successful in sending half-a-dozen wireless messages from a biplane to a station on the aviation ground. The messages were sent from a height of over 500 ft., and the maximum distance was from 2 to 2½ miles.

CONTRACTS OPEN and CLOSED.

OPEN.

Argentina.—The Post Office has been authorised to spend $501,696·45 in the construction of new telegraph lines, and the Legation in London has been authorised to purchase cable, instruments, insulators and wire to the value of $196,593.—*Review of the River Plate.*

Australia.—February 7th. 250 indicators for the P.M.G.'s Department in Victoria. See "Official Notices" December 16th.

March 7th.—Eleven sections of a branching multiple magneto lamp-signalling switchboard, for the P.M.G.'s Department in Victoria. See "Official Notices" December 16th.

March 14th.—Installation of wireless telegraphy at Thursday Island and Papua, for the P.M.G. of Australia. See "Official Notices" December 23rd.

April 18th.—One common-battery switchboard, for the P.M.G.'s Department in Western Australia. See "Official Notices" Dec. 23rd.

February 21st.—29 miles of telegraph cable, for P.M.G.'s Department, Victoria. See "Official Notices" January 6th.

February 28th.—One petrol-driven portable winch, for P.M.G.'s Department, Victoria. See "Official Notices" January 6th.

February 28th.—Motor-generator and accumulators, for the P.M.G.'s Department in Victoria. See "Official Notices" Jan. 13th.

March 7th.—10,000 telephone protectors, for the P.M.G.'s Department in Victoria. See "Official Notices" January 13th.

March 8th.—Measuring instruments for the P.M.G.'s Department in Queensland. See "Official Notices" January 20th.

Barnes.—February 13th. Straight-tube water-tube boiler fitted for machine stoking, 600-750-KW. steam dynamo, surface condenser, motor-driven air and circulating pumps, river work and piping, for the U.D.C. See "Official Notices" Jan. 13th.

Birmingham.—January 30th. Stores for the Corporation Tramways Department. See "Official Notices" Dec. 30th.

Bacup.—February 5th. High and low-tension cables and ducts, transformers and meters, for the Corporation. See "Official Notices" January 13th.

Blackburn.—February 13th. Stores, for the Corporation Electricity and Tramways Department. See "Official Notices" to-day.

Cape Town.—March 1st. Tenders are invited for the installation of a system of ventilation, heating and cooling in the new Law Courts. See this column in our issue of December 30th.

Germany.—The municipal authorities of Langenbrand, near Rastadt, are about to invite tenders for the establishment of a central electric lighting station in the town.

Glasgow.—February 6th. Electric light wiring and fitting for the first section of the new slaughterhouses in Hill Street, for the Corporation. Specifications from Mr. Lackie, city electrical engineer (deposit £1).

Halifax.—February 6th. Stores and materials for the Corporation Tramways and Electricity Departments. See "Official Notices" January 20th.

India.—February 6th. Combined H.T. and L.T. switchboards for new sub-stations, and switchboards for the Cossipore station, for the Calcutta Electric Supply Co., Ltd. See "Official Notices" January 13th.

Ipswich.—February 9th. Continuous-current high-pressure steam turbo-generator (600 or 750 KW.), with surface-condensing plant, for the Corporation. See "Official Notices" January 20th.

Leeds.—February 16th and 21st. (*a*) 1,500 alternating-current watt-hour-meters; (*b*) coal and stores, for the City Electric Lighting Department. See "Official Notices" January 20th.

Leek.—February 9th. Diesel engine and D.C. dynamo, for the U.D.C. See "Official Notices" January 20th.

London.—ISLINGTON.—February 23rd. Electrical and engineers' stores, for the B.C. See "Official Notices" January 13th.
HAMMERSMITH.—The Electricity Committee is about to invite tenders for stores for the year.

Norway.—February 1st. Tenders are invited by the Norwegian State Telegraph Department for the supply of hard drawn copper wire, as follows:—42·45 (metric) tons of 2·75 mm. dia., 13·7 tons 3·3 mm. dia., 54·65 tons of 4 mm. dia. and 205·1 tons of 4·5 mm. dia. Sealed tenders, marked "Anbud paa Kobbertraad 2·75 mm.," or, as the case may be, to "Telegrafstyrelsen," Christiania. Specifiations and forms of tender (in Norwegian) may be seen at the Commercial Intelligence Branch of the Board of Trade in London.

Rawtenstall.—February 1st. Extension to the H.T. switchboard at the Cloughfold Electricity Works, for the Corporation. See "Official Notices" January 20th.

Roumania.—March 1st. The municipal authorities of Tecuel are inviting tenders for the concession for the electric lighting of the town.

Salford.—February 13th. Stores for a year, for the Corporation Electricity Department. See "Official Notices" January 20th.

Spain.—The municipal authorities of Alcaracejos (province of Cordoba) have just invited tenders for the concession for the electric lighting of the town during a period of 10 years. Similar tenders for a five years' concession have also just been invited by the municipal authorities of Mondragon (Guipuzcoa province.)

Turton.—February 20th. Bare copper overhead mains, poles, &c., for electric lighting in Bromley Cross area and Bradshaw Road, &c., for the U.D.C. See "Official Notices" January 20th.

Wakefield.—February 14th. 800-KW. steam alternator, for the Corporation Electricity Department. See "Official Notices" January 20th.

West Ham.—January 31st. Supplies, &c., for the Corporation Electricity Department. See "Official Notices" January 20th.

CLOSED.

Australia.—An order for two 32-H.P. petrol motor tower wagons has been placed by the Australian Government with the Albion Motor Car Co., Ltd., of Scotstoun, Glasgow, for use in the maintenance of the overhead conductors in connection with the electric tramways in Sydney.

Barking.—The U.D.C. has accepted the following tenders:—

Diesel Engine Co., Ltd.—400-KW. Diesel generator, £5,260.
D.P. Battery Co., Ltd.—Traction battery and booster, £570.
Electric Construction Co.—Switchboard, £458.
Vaughan & Sons, Ltd.—Overhead travelling crane, £258.

Fresh tenders are to be invited for the supply of a motor-generator and alternatively of a rotary converter.

Belgium.—Six concerns submitted tenders to the Société Nationale des Chemins de Fer Vicinaux, of Brussels, for the overhead equipment of the light electric railways in the Bruges district, the lowest being that of the Société A.E.G. Union Electrique, of Brussels.

Blackpool.—The tender of Mr. G. Morrison for supplying electric fittings at the new Health Offices, Sefton Street, has been accepted.

Edmonton.—CORRECTION.—Our note of last week regarding the new Infirmary installation stated that the *tender* of Messrs. May & Hawes had been accepted. This manifestly was an error, as it was the *scheme* of this well-known firm of consulting engineers which was adopted. We regret the slip of the pen on the part of our correspondent.

Glasgow.—The following tenders have been recommended for acceptance by the Tramways Committee of the T.C.:—

Armature coils.—Manchester Armature Repair Co.; British Westinghouse Co., Ltd.
Mica strip.—F. Wiggins & Sons; Micanite and Insulators Co., Ltd.
Double lead-sheathed telephone cable.—British Insulated and Helsby Cables, Ltd.
Rubber-insulated cable.—Standard Cable Manufacturing Co., Ltd.
Special track work.—Hadfield's Steel Foundry Co.
Steel pipes and valves, Pinkston.—Babcock & Wilcox, Ltd.
Cypress flitches.—J. Porter & Co., Ltd.
Rail-bending machine.—Chambers, Scott & Co.
Cold sawing machine.—Clifton & Waddell.

Grimsby.—The T.C. has accepted the tender of the Horsfall Destructor Co., for the extension of the refuse destructor, at £800.

Government Contracts.—The following tenders have been accepted during the past month by the Government Departments named:—

ADMIRALTY, CONTRACT AND PURCHASE DEPARTMENT.

Electrical boxes.—Hawkers, Ltd.
Incandescent lamps.—General Electric Co.; British Thomson-Houston Co.

WAR OFFICE.

Distributing boards.—Cox-Walkers, Ltd.; Edison & Swan United Electric Light Co.; Johnson & Phillips, Ltd.; Spagnoletti, Ltd.
Telegraph poles.—Bullers, Ltd.
Installation of electric lighting, Blackdown, Jersey.—G. E. Taylor & Co.

INDIA OFFICE, STORE DEPARTMENT.

Electric fittings.—J. Stone & Co.
Motors, &c.—British Westinghouse Electric and Manufacturing Co.
Switchboard extensions.—Whipp & Bourne.
Telephone sets.—Siemens Bros. & Co.

GENERAL POST OFFICE.

Cable (india-rubber and c. core).—Henley's Telegraph Works Co.
Cable (paper core).—British Insulated and Helsby Cables, Ltd.; Western Electric Co.
Dry cells.—J. C. Fuller & Son; Siemens, Bros. & Co.
Generators.—International Electric Co.
Lightning protectors.—International Electric Co.
Telephones.—British L. M. Ericsson Manufacturing Co.
Five electric lifts at new Money Order office, Holloway, N.—Waygood & Co.
Local telephone exchange equipment at Bournemouth.—Western Electric Co. Ditto at Chiswick.—Western Electric Co.
Conversion of incoming junctions to keyless working at Central Telephone Exchange, London, E.C.—Western Electric Co.
Additional trunk service equipment at Post Office trunk exchange, Birmingham.—British Insulated and Helsby Cables, Ltd.

Haslingden.—The Building Committee this week had before it the report of the consulting engineer, Mr. C. D. Copland, in connection with the 16 tenders for lighting Pike Law new infirmary and other union buildings by electricity. It was resolved that the tender of Messrs. Simpson Bros., of Hapton, at £856 10s., be recommended to the Board for acceptance. The clerk was authorised to discuss an arrangement with Mr. Copland whereby definite arrangements could be made for carrying out the duties of clerk of works for the electric lighting at the new infirmary, the services of Mr. W. F. Thacker to be utilised as far as possible in this connection.

Huddersfield.—The Corporation Tramways Committee has accepted the following tenders:—

J. Varley & Co.—5,000 tons of round green coal.
Chappell & Wood.—2,000 tons of coal.

Hyde.—The T.C. has accepted the tender of Mr. Wm. Oldham for altering the electric light installation at the school and library, at £25 for cables, switches, cut-outs and alteration of switchboard, 5s. per light for lampholder and lamp, and 3s. 9d. each for Osram lamps only.

London.—POPLAR.—The B.C. has accepted the following tenders for the equipment of the generating station, with additional instruments for the detection of waste in fuel and steam consumption:—

Cambridge Scientific Instrument Co.—CO_2 recorder, £30.
Baird & Tatlock.—Recording barometer, £4 5s.
Leskole & Co.—Flue temperature and superheat recorder, £47 12s.
A. Wright & Co.—Water measuring apparatus, with recorder, £30.
G. Kent & Co.—Water meter, £62.

The Stepney B.C. Electricity Supply Committee received tenders, as below, for steel flooring for the Limehouse station:—

Edward Wood & Co., Ltd. (recommended)	£718
E. Danks & Co. Oldbury, Ltd.	750
Babcock & Wilsox, Ltd.	810
General Iron Foundry Co., Ltd.	823
Blake Boiler, Wagon and Engineering Co., Ltd.	868
Redpath, Brown & Co., Ltd.	890
Strachan & Henshaw, Ltd.	1,533

For additional coal supplies up to June, 1911, the following tenders have been accepted :—

A. Blackmore & Co.—300 tons Wemyss Scotch washed peas, at 11s. per ton.
Bradbury, Son & Co., Ltd.—300 tons Glasbrook Merthyr nutty small, best Welsh (Admiralty), at 19s. 10d. per ton.
Cory Bros. & Co., Ltd.—500 tons Scotch peas, Bridgeness and Bank, at 11s. 1d. per ton.

Tenders are to be invited for a further 3,000 tons of bituminous and other small coals required between now and April 30th, 1911.

L.C.C.—The Stores and Contracts Committee has accepted the tenders of the following :—

Hooper's Telegraph and India-Rubber Works, Ltd.—Electric cables and wires.
Geo. Angus & Co., Ltd.—Asbestos goods.
Sunbeam Lamp Co., Ltd.—Electric fittings.

The Highways Committee received the following tenders for electric motors and a 25-KW. motor-generator required at 23, Belvedere Road :—

	Motors.	Motor-generator.	Total.
Lancashire Dynamo Co., Ltd. (recommended)	£413	£168	£581
British Thomson-Houston Co., Ltd.	430	178	608
" " " (alternative)	—	175	—
Electric Construction Co., Ltd.	534	207	741
Dick, Kerr & Co., Ltd.	565	223	788
British Westinghouse Co., Ltd.	420	—	—

Estimate of chief officer, £600.

For wiring material for the same building, tenders were received thus :—

Edison & Swan Co.	(recommended) £386
General Electric Co., Ltd.	396
Veritys, Ltd.	(incomplete tender) 901

The Council has accepted the tender of the Edison & Swan United Electric Light Co., Ltd., at £377 for the supply of wiring materials at 23, Belvedere Road ; also the tender of Hooper's Telegraph and India-Rubber Works, Ltd., for electric cables and wires.

Ship Lighting.—Messrs. Siemens Bros. Dynamo Works, Ltd., Dalston, have obtained the contract for the supply of tantalum metal-filament lamps to the Royal Mail Steam Packet Co., for the ensuing 12 months, for ship lighting.

South America.—According to the *Review of the River Plate* the tender of Messrs. Siemens Bros. & Co., for telegraph material for the railway from San Antonio to Lake Nohuel Huapi, has been accepted by the Government.

Southend.—The T.C. has accepted the tender of Messrs. Crompton & Co., of Chelmsford, for re-winding a 500-KW. dynamo, at £85 ; and that of the Lancashire Dynamo Co., Ltd., of Manchester, for booster plant for the new battery storage room at Chalkwell Park, at £1,696 5s.

Taunton.—The T.C. has accepted the tender of Messrs. Newton, of Taunton, for a 500-volt 10-H.P. motor for the condenser on the three years' hire-purchase, at 30s. per month, and a 500-volt 4-H.P. motor for the feed pump, at 15s. 9d. per month.

FORTHCOMING EVENTS.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, January 27th. At 7.30. At the Lit. and Phil. Society, Newcastle. Resumed discussion on Mr. D. B. Morrison's paper on the "Economical Working of Reciprocating Marine Engines and their Auxiliaries."
Friday, February 3rd. At 7.30 p.m. At the Westgate Assembly Rooms, Newcastle. Conversazione.

Royal Institution.—Friday, January 27th. At 9 p.m. Discourse on "Radio-Activity as a Kinetic Theory of a Fourth State of Matter," by Prof. W. H. Bragg.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, January 28th. At 5 p.m. At the King's Head Hotel, Newport. Discussion on Mr. E. K. Scott's paper on "Electricity in New South Wales Collieries."

Junior Institution of Engineers.—Monday, January 30th. At 7.30 p.m. At Caxton Hall, Westminster, S.W. Sixth and concluding lecture on "The Law Relating to Engineering," by Mr. L. W. J. Costello.

Institution of Electrical Engineers (Manchester Local Section).—Tuesday, January 31st. At 7.30 p.m. At the University, Manchester. Papers on "Modern Long-Distance Transmission of Electrical Energy," by Mr. W. T. Taylor (to be read by Mr. J. F. C. Snell), and "Extra High-Pressure Transmission Lines," by Messrs. R. B. Matthews and C. T. Wilkinson.

Illuminating Engineering Society.—Tuesday, January 31st. At 8 p.m. At the Royal Society of Arts. Discussion on "Library Lighting," opened by Messrs. J. D. Brown and S. L. Last, to be resumed.

Institution of Electrical Engineers (Students' Section).—Wednesday, February 1st. At 7.45 p.m. At the Institution Building, Embankment, W.C. Paper on "Telephony," by Mr. H. Clark.

Institution of Electrical Engineers.—Thursday, February 2nd. At 7 p.m. At the Hotel Cecil. Annual dinner and reunion.

Appointment Vacant.—Switchboard attendant, for the Bootle Electricity Works (£80). See our advertisement pages in this issue.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

THE following orders are issued :—

Commanding Officer—COL. H. M. LEAF.

Monday, January 30th.—"A" Company. Technical drill, 7 to 10 p.m.

Tuesday, January 31st.—"B" Company. Technical drill, 7 to 10 p.m.

Thursday, February 2nd.—"C" Company. Technical drill, 7 to 10 p.m.

Friday, February 3rd.—"D" Company. Technical drill, 7 to 10 p.m.

Saturday, February 4th.—At 8 p.m., Social Club Bohemian Concert at Caxton Hall. All members are requested to make an effort to be present.

(Signed) P. H. CAMPBELL, Capt. R.E., Adjutant.

NOTES.

Callender's Hospital Fund.—The report of Callender's Hospital and Distress Fund for 1910 shows that the 1d. a week subscriptions produced £199, every employé being a subscriber. A donation of £50 from the firm, one from Mr. T. O. Callender of £5 5s., and seven £2 2s. donations by directors and others enabled £194 to be distributed to hospitals and other institutions, £61 to be distributed to distress cases, and £8 to be paid for spectacles. During the past eight years the fund has contributed £1,645 to hospitals and other institutions.

Institution and Lecture Notes.—SOCIETY OF ENGINEERS (INC.).—The annual dinner of the Society took place at the Criterion Restaurant on the 18th inst., and was well attended. The chair was occupied by Mr. Diogo A. Symons, the retiring President. The loyal toasts having been honoured, Sir Edward Raban proposed the toast of "Applied Science," responding to which Prof. Boys said that the relations between pure and applied science were admirably illustrated by wireless telegraphy, in the development of which they had the most marvellous pure science in the work of Maxwell and Hertz at one end, and the applied science of Marconi at the other. Mr. J. W. Wilson, submitting "Kindred Institutions," said that the phrase suggested the reduction of all societies to one, and referred to the successful amalgamation of the Society of Engineers with the Civil and Mechanical Engineers' Society a year ago. Mr. Alexander Siemens, who replied, found fault with the terms "pure" and "applied" science ; applied science was science, and the other was not. Engineers were the civilising people, and the rest were no better than they were 2,500 years ago. An excellent programme of music, under the direction of Mr. Charles Capper, was performed during the evening.

The competition for the "Status Prize" awarded by the Council of the Society for the best paper written by any person on the subject of "How to Improve the Status of Engineers and Engineering, with special reference to Consulting Engineers," to the value of six guineas, will remain open until May 31st.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS.—A meeting of the Newcastle Branch took place on January 14th, when the President, Mr. W. Maurice, stated with regard to the examination scheme that it had been decided to hold the first examination on March 7th and 14th, subject to the registration of the Association being complete by that time.

Mr. G. B. Burrows then opened a discussion on "the best method of connecting H.T. overhead lines with underground cables and leading the same into sub-stations." He said that the usual construction was to employ shackle insulators supported on channel steel built into the sub-station wall, care being taken that the insulating tube leading into the interior was small enough to prevent the ingress of birds. For terminal poles the H-type was most generally used, although light lattice towers were coming into favour. The dividing boxes should have the insulators wide apart, and the latter should be provided with proper umbrellas. No joint should be made inside a dividing box. For lightning protection a bare earth wire of at least No. 8 section should be run above the conductors and connected to all iron work and lightning arresters. Earth plates of cast-iron or other suitable material should be sunk every 500 yards, and sound connection made between them and the earth wire. The limiting resistances might consist of the earthenware trough type filled with a 25 per cent. solution of glycerine and water. He had not found the jelly, which formed on the top of this mixture, impair the working. Further protection against surges might take the form of roller spark gaps in series with limiting resistances of carbon.

Mr. H. J. Fisher said that choke coils usually consisted of 10 turns of the line conductor coiled on a 3-in. mandrel. He had found a covering of ferro-concrete a great protection to the bases of poles, and his practice was to use a No. 4 galvanised iron wire as an earth wire, this being earthed at every fourth pole. Carborundum resistance rods frequently burst under working conditions, and with regard to horn arresters he usually set them at ¾ in. on a 6,000-volt

line, although text-books gave about one-third of this distance. With an insulated neutral it was necessary to have simultaneous surges in two of the lines to cause the dischargers to act, but with an earthed neutral there need only be a disturbance in one.

Dr. Thornton mentioned a case which occurred in Newcastle, in which exhaust steam, impinging upon a disused telephone wire, charged it up to 40,000 volts, with fatal results to a workman who touched it.

After the meeting Dr. Thornton gave an informal demonstration of the action of soapy water on coal dust. Ordinary water was shown to have comparatively little effect, as it did not readily mix with the fine dust found in colliery roadways, and also, after it had dried off, the dust was left in its original condition. A soapy solution, however, had quite an affinity for the dust, and on drying out, a comparatively hard covering was left on the bottom and sides of the dish.

The opinion of the members was that Dr. Thornton's idea was well worth an extended trial under working conditions, and that very important results might be expected.

INSTITUTION OF POST OFFICE ELECTRICAL ENGINEERS.—The Metropolitan Centre held its fourth ordinary meeting of the present winter session at the Institution of Electrical Engineers on the 16th inst., when Mr. L. J. Sell read a paper on "Testing Paper-Core Underground Cables during Construction." Mr. Sell advocated the use of the "looped end" (one end of the cable only being open), against the method of a "free end" (with both ends open), and discussed the advantages and defects of three methods of looping. Under the heading, "Localisation of Faults," the difficulty usually experienced with P.C. cable, of all wires being faulty, was noticed, and Messrs. Henley & Davage's patent for overcoming the difficulty by including an india-rubber or gutta-percha-covered wire in the cable was mentioned. Various methods of localising a fault in a lead sheath were described, and Mr. Sell related some of his personal experiences. Under the heading, "Removal of Faults," the present method of desiccating with dry acid was considered and criticised. Two alternative methods were suggested, one being to exhaust moist air by a pump and admit dry air; the other, the use of dry air with a varying pressure. In the discussion which followed, a graphic method of localising a pressure leak by observations of falling pressure at the two ends of the cable was described, which was found in practice to give very accurate results.

INSTITUTION OF ELECTRICAL ENGINEERS (YORKSHIRE LOCAL SECTION).—The annual dinner of this Section will be held at Leeds (Hotel Metropole) on Friday, February 10th, at 6.30. On the 15th inst., at the meeting to be held at Leeds, Mr. W. T. Taylor's paper on "Modern Long-Distance Transmission of Electrical Energy," will be read by Mr. J. F. C. Snell.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS.—At a meeting of the West of Scotland Branch, on 20th inst., Mr. W. A. Wilson submitted a paper on "The Function and Limitations of Fool-Proof Devices." At the outset he maintained the view that the fundamental object of all protective devices should be the protection of plant, and that the protection of human life should be only secondary. It was, doubtless, proper to have gear in the working face of a mine so protected as to preclude, if possible, the chances of shock, and to insist that a fuse on a switchboard should not be in such a position as to damage the eyes of the attendant in carrying out his duties, while it was proper, too, that the most absolute precautions should be taken to ensure that no man was allowed to work on a high-tension circuit until it was definitely known that the circuit was either dead or discharged; but it became a different matter when, for example, they began to hedge in the switchboard with fences or to provide in the power station devices which were intended to protect the fools. He took it that one of the objects of the Association was to exclude the fool from having anything to do with the superintendence or manipulation of electrical plant. In the course of a brisk discussion which followed, Mr. C. W. Holman, Glasgow, said he could not agree with the author that the protection of machinery should take a primary place over that of human lives. In his opinion, all electrical switchgear in mines should be made as absolutely safe as possible, irrespective of whether it was going to be handled by a skilled man or a fool, so that all danger from shocks and burns was entirely eliminated. This was quite simple and inexpensive by mechanical locking arrangements, which could be made of a simpler description than some already on the market.

INSTITUTION OF MECHANICAL ENGINEERS.—On Friday last Messrs. W. Dixon and G. Baxter read a paper on "Modern Electrical Dock Equipment," describing the installation at the Rothesay Dock, Clydebank, where the whole of the machinery, including the coal hoists, is electrically operated. There was a very lively discussion, which will be resumed at a later meeting.

INSTITUTION OF ELECTRICAL ENGINEERS (BIRMINGHAM).—The fourth annual dinner of the Birmingham Section was held on Wednesday last week; Mr. M. J. Railing presided.

INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND.—On Tuesday last the adjourned discussion on Prof. Nicolson's paper on "Boiler Economics and the Use of High Gas Speeds," was resumed, and a paper by Prof. A. H. Gibson on "Experiments on the Efficiency of a Live Steam Feed-Heater" was down for reading. A smoking concert will be held on March 4th.

Speaking at a meeting of the Glasgow University Company of Honourable Alchymists on Monday evening, on the "Electric Light of the Future," Dr. R. A. Houstoun gave a *résumé* of the principal theoretical works on the subject, describing in detail how an energy spectron could be plotted. He then dwelt with the chief modern means of lighting, discussing possibilities of each as energy transformers, and in concluding expressed the opinion that the electric light of the future would ultimately be found in some development of the vacuum tube.

Prof. E. W. Marchant, B.Sc., of the Liverpool University, delivered a lecture at the Central Y.M.C.A., Liverpool, on 23rd inst., on the "Generation and Transmission of Electrical Power."

Mr. Archibald R. Low, M.A., whose name is not unfamiliar to readers of our "Correspondence" columns, will deliver an advanced course of eight lectures, together with drawing office work, on "The Design and Calculation of Aeroplanes," at University College on Fridays, at 5.30 p.m., beginning February 3rd. The course is arranged to enable a technical engineer to design and calculate an aeroplane for actual flight, and to predetermine its performance. A visit will be paid to the aviation ground at Brooklands. Further particulars may be obtained from the Secretary of the College.

Network Plans and Diagrams.—The following letter arrived too late for our "Correspondence" columns:—

"In your issue of January 20th, appears a letter signed 'Wotsle,' in which is an objection, on the score of expense, to the system of network plans described in the above article. When I took up my present appointment at Swindon, I found there a set of plans and records, similar in essentials to the system mentioned above, which had been prepared with much care and attention to detail, by my predecessor, in the time he could spare from his many duties as chief assistant engineer. The actual cost is represented by the amount spent on (1) ordnance survey maps, and (2) the specially printed book for service details. Even if a draughtsman was specially appointed to do this work, the payment of his salary for, say, three months, would not make a very big hole in the revenue of any undertaking, and I think that three months' continuous work would be sufficient for the preparation of the plans.

"If 'Wotsle' thinks this £40, or thereabouts, expensive, for a complete set of mains plans, I do not think many of our engineers will agree with him.

"The next item, *re* alterations, I consider to be somewhat over-rated as regards difficulty. In the case of a consumer's service being taken out, a pencil note to this effect on the plan of the building concerned, will meet the case, as in most cases, the service will be required at a later date. If a building is altered, or, perhaps, a street remade, and the building line, and hence the cable track altered, if the alteration involves only a square inch or so of the plan, I think an ink eraser will do all that is necessary. If, however, a large area is affected, I can suggest nothing better than pasting over a piece of very thin, but opaque paper, and redrawing. In most towns, as the ordnance survey dates back some years, many such alterations will be found necessary where new buildings have been erected; but if thin paper is used, and the redrawing done neatly, and in conformity with the rest of the plan, I do not think the adjective 'unsightly' can be used to describe the result.

"C. W. RYCROFT.

"Swindon, *January 24th*, 1911."

Arc Works Festivities.—At the Corn Exchange, Chelmsford, last Saturday week, about 800 wives and children of the employés of Messrs. Crompton & Co., Ltd., were entertained to their annual tea and Christmas tree. Colonel Crompton and other directors and friends were present at the tea. There were 50 babies in the baby show, and Miss Violet Millicent Cuthbertson, age three weeks, won first prize.

Smoking Concert.—The members of the Central Electric Athletic and Rifle Club, which is connected with the Central Electric Supply Co., St. John's Wood, held their first annual smoking concert on Saturday, January 14th, at Paddington. Mr. H. P. Gaze presided, and Mr. W. J. D. Partridge, the founder of the club, acted as vice-chairman. The arrangements were made by the hon. secretary (Mr. H. Morton). Badges and certificates were presented to successful marksmen in the club competitions.

Smoke Nuisance.—On 18th inst., at Salford Police Court, the local Electricity Committee was fined 20s. for a smoke nuisance at its electricity works. The electrical engineer, for the defence, stated that at the present time it was impossible to avoid some smoke, whereupon the stipendiary said they should enlarge the works.

Tramway Staff Dinner.—A social evening was spent by the staff of Blackpool, St. Anne's and Lytham Tramway Co. on January 20th, when they held their fifth annual dinner. The proceedings were presided over by Mr. H. W. Laing, the manager.

Discharge Suspended for Four Years.—Clifton Robinson, son of the late Sir J. Clifton Robinson, applied for his discharge in the London Bankruptcy Court on Tuesday. His liabilities were returned at £34,790, but the assets so far received were £805. The Official Receiver opposed the application, urging gross extravagance. The indebtedness included nearly £30,000 in respect of loans from Sir Clifton Robinson and professional moneylenders. The discharge was suspended for four years.

The Brimsdown Lamp Works.—Through the courtesy of the Imperial Lamp Works, Ltd., we were on Friday last enabled to inspect the up-to-date factory which the company has erected at Brimsdown, for the complete manufacture of metal filament lamps. We hope to describe these works in a later issue.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The Electricity Committee of Bristol City Council has decided in favour of MR. A. J. NEWMAN (who has been performing the duties of the office since the promotion of Mr. Wilson) being appointed mains superintendent at a salary of £180 per annum, rising to a maximum of £200 at the end of 12 months.

MR. S. C. MATTHEWS, of the Bury Corporation Electricity Works, has been awarded a medal and diploma for a short paper on "Water-Tube Boilers," in a competition held in connection with the recent Manchester Engineering Exhibition.

Tramway Officials.—MR. J. W. DUGDALE, who has been manager of the Ashton Tramways for some time, has been appointed manager of the Oldham Corporation Tramways, in succession to MR. L. SLATTERY.

General.—The Essex Fortress Engineers (Electricals) are about to lose one of their officers, as MR. A. NEVILLE has resigned his position as Lecturer in Chemistry at the County Laboratories, Chelmsford, in order to take a special course of advanced work in the Department of Agriculture at Cambridge University. Lieut. Neville joined the Fortress Engineers some two years ago as second-lieutenant, being subsequently promoted to his present rank, and he will be greatly missed.

On Saturday last, MR. H. M. HOBART, who is leaving this country, was entertained at a farewell dinner at the Trocadero by upwards of 70 of his friends, and was presented with a handsome souvenir in the shape of a silver cup, inscribed with the names of the donors. Dr. H. F. Parshall presided, and in toasting the guest of the evening, gave a brief but humorous account of his first meeting with Mr. Hobart, and of the invaluable services that the latter had subsequently rendered to him, especially in connection with the Central London Railway. Dr. J. A. Fleming testified to the high esteem in which Mr. Hobart was held as lecturer on the design and construction of electrical and other machinery at University College, and Mr. Hammond alluded to the benents derived by Faraday House from his assistance. Mr. Hobart feelingly responded to the toast, expressing his deep appreciation of the honour conferred upon him and of the kindness he had always experienced from his friends in this country. Mr. Hobart, who graduated from the Massachusetts Institute of Technology in 1889 with the degree of B.Sc., was at first associated with the Thomson-Houston and later with the General Electric Co. In 1895 he came to England to join the British Thomson-Houston Co., Ltd., and was responsible for the electrical design of many important undertakings. In 1900 he joined the Union Elektricitäts Gesellschaft as chief designing engineer for D.C. machinery, but since 1903 Mr. Hobart has practised in London as a consulting engineer, specialising in the design, inspecting and testing of electrical machinery. He has also delivered courses of lectures in several of our leading technical colleges, and has published no fewer than 14 important treatises on various branches of electrical work, either alone or in collaboration with others; several of his works have been translated into French and German. The last of these books—an encyclopædic Dictionary of Electrical Engineering—of which he was editor, assisted by a large staff of electrical men, has just been issued. Mr. Hobart has also contributed freely to the columns of the technical Press and to the proceedings of engineering institutions, and as one of our most valued contributors he carries with him our sincere good wishes for his prosperity in the new and important sphere of work to which he is now transferring his distinguished abilities.

The Academy of Siences has selected M. BRANLY, of wireless telegraph fame, to fill the place left vacant by the death of M. Gernez.

MR. W. T. TAYLOR, who is engaged with the Central Mexico Light and Power Co., has just completed an important work at San Luis, Potosi, which included the erection of a 100,000 volts transmission station extending over a mountainous country for 200 miles from the nearest power station. He is proceeding to Rio de Janeiro to superintend a huge engineering work there. Mr. Taylor is the author of one of the papers read at last night's London meeting of the Institution of Electrical Engineers.

According to the *Times*, a marriage will take place quietly in March between DR. J. A. EWING, C.B., F.R.S., Director of Naval Construction, and Ellen Lina, daughter of the late Dr. John Hopkinson, F.R.S.

MR. GEORGE WRIGHT, M.I.E.E., of Lahore, has been appointed, by Government, electrical adviser and consulting engineer to the Ouhd and Rohilcund Railway, in addition to his present duties as electrical engineer to the North-Western Railway.

Messrs. Ellis & Ward, Ltd., of Edmund Street, Birmingham, have opened a branch office at 93, St. Mary's Street, Cardiff, to deal with their South Wales business. They have appointed MR. R. L. BOOTH (late of W. J. Fryer & Co., Paddington) as branch manager, who will be pleased to receive copies of latest lists, together with discount sheets.

NEW COMPANIES REGISTERED.

Empire Aluminium Co., Ltd. (113,563).—This company was registered on January 6th, with a capital of £75,000 in £1 shares (25,000 preferred ordinary and 50,000 deferred ordinary), to carry on the business of manufacturers of, and dealers in, aluminium and aluminium foil, dealers in metal and metal products, &c., to acquire and work certain licences for the use of certain inventions relating to the manufacture of aluminium foil in the United Kingdom and Isle of Man, and the user of certain secret processes in connection therewith, and to adopt an agreement with the International Foil Co., Ltd. The subscribers (with one share each) are:—D. G. A. Raid, 41, Eastcheap, E.C., merchant; H. B. Owen, 4, Lloyd's Avenue, E.C., merchant; E. Ames, 86, Kensington Park Road, W., merchant; Mrs. S. C. Ames, 86, Kensington Park Road, W.; P. S. Brown, 204, Polmadie Road, Glasgow, manufacturer; A. J. Faulding, 265, Strand, W.C., director; A. O. Warren, 4, Broad Street Place, E.C., solicitor. Minimum cash subscription 10 per cent. of the shares offered to the public. The number of directors is not to be more than seven. The first are E. Ames, P. S. Brown, A. J. Faulding, W. Walker, A. Mecham, J. Millar, J.P., and A. P. Linnett. The preferred ordinary shareholders have the permanent right to be represented by a majority on the board; no qualification necessary; remuneration as fixed by the company. Registered by Ince, Colt & Ince, St. Benet Chambers, Fenchurch Street, E.C.

Carborundum Co., Ltd. (113,532).—This company was registered on January 5th, with a capital of £10,000 in £1 shares, to carry on the business of manufacturers of abrasive grinding wheels, sharpening stones, hones, paper and cloth grit and grains, and other abrasive materials, manufacturers of products of electric furnaces of all kinds, &c., and to adopt an agreement with the Carborundum Co. (incorporated in Pennsylvania, U.S.A). The subscribers are:—M. Hawke, 29, Clifton Street, E.C., manager, 100 shares; L. Nitzhanski, 29, Clifton Street, E.C., chief clerk, 1 share; F. H. Eastoe, 29, Clifton Street, E.C., accountant, 1 share. Private company. The number of directors is not to be less than three or more than six; the first are F. W. Haskell, G. R. Rayner, F. H. Manley and M. Hawke. Table "A" mainly applies. Registered by Treherne, Higgins & Co., 7, Bloomsbury Square, W.C.

Bastian Foreign Patents, Ltd. (113,530).—This company was registered on January 5th, with a capital of £10,500 in 10,000 ordinary shares of £1 each and 10,000 deferred shares of 1s. each, to carry on the business of manufacturers of and dealers in electric heaters, cooking stoves and other kindred appliances and inventions. The subscribers (with one ordinary share) are:—F. Sidney, Broad Street House, E.C., secretary; F. Dawson, Broad Street House, E.C., clerk; A. North, Broad Street House, E.C., solicitor; F. King, 152, Marylebone Road, N.W., clerk; C. O. Bastian, 91-3, Palmerston House, E.C., engineer; R. C. Hunt, 170, Palmerston House, E.C., clerk; L. Gray, 170, Palmerston House, E.C., clerk. Minimum cash subscription, £7. The number of directors is not to be less than two or more than seven: the subscribers are to appoint the first; qualification, £100; remuneration (except managing director) £50 each per annum and £25 extra for the chairman. Registered by W. T. Hick, Broad Street House, E.C.

North Lancashire Tramways, Power and Construction Syndicate, Ltd. (113,495).—This company was registered on January 2nd, with a capital of £10,000 in £1 shares, to carry on the business of general contractors, constructors of tramways, railways, canals and other works, &c. The subscribers (with one share each) are:—W. O. Forder, Trefusis, Lancaster Gardens, East Finchley, N., clerk; E. A. Hussey, 29, Elmcroft Street, Clapton, N.E., clerk. Private company. The number of directors is not to be less than two or more than seven; J. Newell is the first chairman; remuneration of chairman £150 per annum; of ordinary directors, £100 each per annum; of managing director as fixed by the company. Registered by Milner & Bickford, 10, Moorgate Street, E.C.

Leskole Co., Ltd. (113,501).—This company was registered on January 3rd, with a capital of £1,000 in £1 shares, to carry on the business of consulting, advisory or superintending electrical and mechanical engineers, manufacturers of, and dealers in, engineering and electrical specialities, &c., to acquire the business carried on by C. A. Hartung as the "Leskole Co." The subscribers (with one share each) are:—C. A. Hartung, 12, Bregenerstrasse, Berlin, engineer; G. A. H. Binz, 15, Woodberry Avenue, Winchmore Hill, N., engineer. Private company. The number of directors is not to be more than three; the first are C. A. Hartung and G. A. H. Binz (both permanent); qualification, £300; remuneration, £10 per annum. Registered office, Palace Works, Enfield.

Carney & Pearn, Ltd. (113,663).—This company was registered on January 14th, with a capital of £4,000 in £1 shares, to carry on the business of electrical engineers and contractors, electricians, suppliers of electricity, manufacturers of electric magnetos and other apparatus, motor-car engineers, &c. The subscribers (with one share each) are:—H. A. Carney, 10, Sycamore Street, Cheetham, Manchester, electrical engineer; J. A. Pearn, Aldersyde, 2, Princes Road, Heaton Moor, Manchester, electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are H. A. Carney and J. A. Pearn (both permanent); qualification, 20 shares; remuneration as fixed by the company. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

Electrical Power Users' Association, Ltd. (113,665).—This company was registered on January 14th, with 100 members, each liable for £1 in the event of winding up, to enable members who are users of electrical and other installations, plant, apparatus and machinery to insure against fire and other risks, to undertake the erection, inspection and general maintenance of any such installations and plant, &c. The subscribers are:—Right Hon. Earl Russell, Telegraph House, Chichester; Sir Richard C. Temple, Bt., The Nash, Worcester; Col. W. C. Dickenson, 22, Hereford Square, South Kensington, S.W.; Capt. J. T. Scriven, Moor House, Staines; O. Huxley, 120, Caldershaw Road, Ealing, W., consulting engineer; L. W. Dilloway, Clissold House, 149, Green Lanes, Clissold Park, N.; J. Johnstone, 17 and 18, Basinghall Street, E.C., solicitor. The number of directors is not to be less than five or more than 20; the first are Right Hon. Earl Russell, Sir Richard C. Temple, Bt., Col. W. C. Dickenson, Capt. J. T. Scriven and O. Huxley; remuneration of chairman, £250; vice-chairman, £200; and of ordinary directors, £150 each per annum.

Porlock and District Electric Supply Co., Ltd. (113,709).—This company was registered on January 21st, with a capital of £2,500 in £1 shares, to carry on at Porlock and elsewhere in Somerset the business of an electric light company in all its branches. The subscribers are:—Sir Francis C. Gould, 3, Endsleigh Street, Tavistock Square, W.C., and Upway, Porlock, 10 shares: T. Rawle, Court Place, Porlock, yeoman, 200 shares; T. Pearce, Glen Lodge, Porlock, tanner, 25 shares; J. W. Willis, Porlock, postmaster, 50 shares; J. Cooksley, Porlock, builder, 25 shares; J. Ridler, Porlock, bootmaker, 10 shares; I. Burgess, Porlock, builder, 10 shares. Minimum cash subscription, £1,500. The first directors are Sir Francis C. Gould, T. Rawle, T. Pearce, J. W. Willis and J. Cooksley. Secretary and office: S. Cooksley, West Cottage, Porlock.

Electric Hiring Syndicate, Ltd. (113,732).—This company was registered on January 18th, with a capital of £1,000 in £1 shares, to carry on the business indicated by the title, and to adopt an agreement with W. A. Smith. The subscribers are:—G. J. Lothian Nicholson, Albany Chambers, York Street, Westminster, engineer, 50 shares; W. McPherson, Bank Buildings, Kingsway, W.C., secretary, 10 shares. Private company. The number of directors is not to be less than two or more than four: the first are J. Lothian Nicholson and R. B. Matthews; qualification, 10 shares. Registered office, Bank Buildings, Kingsway, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

T. E. Smith & Co., Ltd.—Debenture dated December 29th, 1910, to secure £100, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. M. Smith, 7, Cavendish Street, Keighley.

Northampton Electric Light and Power Co., Ltd.—Issues on various dates from November 15th to December 30th of £40,000 debentures, parts of a series of which particulars have already been filed.

Cleveland and Durham Electric Power, Ltd., and Reduced.—Issue on December 22nd of £39,500 debentures, part of a series of which particulars have already been filed.

British Insulated and Helsby Cables, Ltd. (52,285).—Trust deed dated November 28th, 1910 (supplemental to trust deeds dated July 22nd, 1901, and May 21st, 1902, securing £500,000 4½ per cent. first mortgage debenture stock). Property charged: Various freehold lands and premises in Prescot, Liverpool, Helsby and Whiston. Trustees: Hon. Arthur Stanley, M.P., 50, Upper Brook Street, W.; and J. S. Harmood Banner, M.P., 24, North John Street, Liverpool.

British Tramways and General Construction Co., Ltd. (78,034).—Return dated January 13th, 1911, filed same date. Capital, £300,000 in £1 shares. 241,000 shares taken up, £241,000 paid. Mortgages and charges: £13,191 19s. 6d.

Lewes and District Electric Supply Co., Ltd. (64,333).—Particulars of £11,000 debentures, created December 12th, 1910, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £8,800. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

C. F. Casella & Co., Ltd. (106,869).—Issue on January 5th of £100 debentures, part of a series of which particulars have already been filed.

Indian Electric Supply and Traction Co., Ltd. (84,233).—Indian mortgage dated December 18th (supplemental to trust deed dated January 10th, 1910 securing £50,000 debenture stock), charged on company's leasehold, messuages and premises, &c., at Cawnpore, and plant, machinery, chattels, orders, licences and concessions. Trustees: K. A. S. Moncrieff, Salisbury House, London Wall, E.C., and E. H. F. Reeves, Gordonston, Moss Hall Grove, North Finchley.

Banbury and District Electric Supply Co., Ltd. (65,746).—Particulars of £5,000 debentures, created December 12th, 1910, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £1,600. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Bryant Trading Syndicate, Ltd. (65,061).—Particulars of £5,000 debentures, created December 21st, 1910, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Yorkshire (Woollen District) Electric Tramways, Ltd. (71,916).—Particulars of £100,000 debentures, created December 14th, 1910, filed pursuant to Sec. 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £50,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

General Electrolytic Parent Co., Ltd. (39,358).—Return, dated November 10th, filed November 4th, 1910. Capital, £30,000 in £1 shares; 28,608 shares taken up; £10,608 paid; £18,000 considered as paid. Mortgages and charges: Nil.

Llangefni Electric Light and Power Co., Ltd. (111,909).—Indenture dated January 6th, 1911, to secure £700, charged on certain land and premises, &c., in Llangefni. Holder: R. Rowlands, Machraeth View, Llanfachreth, Anglesey.

Ernest Scott & Mountain, Ltd. (32,760).—Issue on December 23rd of £8,900 second debentures, part of a series to secure £25,000. Previously issued of same series: £16,100. Particulars of above have already been filed.

Gilbert Arc Lamp Co., Ltd. (52,679).—Return dated July 19th, 1910. Capital £2,000 in £1 shares; 1,405 shares taken up; £1 per share called up on 705; £700 paid, leaving £5 in arrears; 700 shares considered as fully paid. Mortgages and charges: Nil.

Costa Rica Electric Light and Traction Co., Ltd. (56,447).—Return dated January 5th, filed January 12th, 1911. Capital £130,000 in £1 shares. All shares taken up; £7 paid; £129,993 considered as paid. Mortgages and charges: £257,050.

CITY NOTES.

Metropolitan Railway Co.

THE directors report that the total receipts for the half-year ending December 31st, 1910, amount to £403,169, and the expenses to £200,148, leaving a profit of £203,021. Compared with the corresponding half-year of 1909 the receipts show an increase of £12,413, and the expenses a decrease of £5,506. The net revenue account, after providing for the interest upon the debenture stocks and other fixed charges and placing £10,000 to the electrical renewal and depreciation fund, shows a balance of £157,000, which will permit of the payment of the dividends upon the preference stocks, and leave a balance of £52,489 available for dividend upon the ordinary stock. The directors recommend a dividend upon the ordinary stock, for the half-year at the rate of £1 10s. per cent. per annum, and to carry forward the balance of £9,499, as against £1 per cent. for the corresponding period in 1909, when the carry-forward was £5,927. The surplus lands committee announce that no dividend on the surplus lands stock, for the past half-year, will be at the rate of £2 15s. per cent. per annum. The passenger traffic of the railway maintains a steady progress. The number of passengers carried during 1910 was over one hundred millions, a larger number than has been carried in any previous year of the company's existence. The earnings from goods traffic also show a satisfactory development, to which the new depôt near Farringdon Street has contributed substantially. A Bill is being promoted in the ensuing session of Parliament for the construction of a new station midway between Farringdon Street and King's Cross stations adjoining the Mount Pleasant Post Office, for making a subway at Edgware Road station, and for other purposes. The installation of automatic signalling between Baker Street and Willesden Green has been completed, and the working of the traffic has been materially improved thereby. Good progress is being made with the installation of the system between Willesden Green and Neasden. The reconstruction of King's Cross Station and the erection of the Arcade over the railway at Liverpool Street Station are making satisfactory progress. A contract has been let for widening the tunnel and approach to Baker Street (East) Station from the north. This is the first portion of the scheme for the reconstruction and improvement of the Baker Street Station, for which the company has been gradually acquiring the necessary property for some time past.

	Number of passengers.	Gross receipts for passengers, goods, &c.
1905	95,694,616	£832,034
1906	98,384,766	681,268
1907	96,859,108	640,838
1908	99,846,735	680,357
1909	99,961,997	696,881
1910	102,849,458	718,089

The dividends will be payable on February 9th.

In the accounts the details of capital expenditure during the past half-year include:—Automatic signalling, £14,345; installation of electric traction, £15,117. For the current half-year the estimated expenditure is £138,000 as to £56,000 for lands and compensation and as to £82,000 for works and engineering. The company has 20 electric locomotives, 102 third-class motor coaches, 76 first class, 20 composite, and 96 third-class trailer coaches, and 26 converted compartment coaches. In the working expenses for the past half-year, £21,147 appears for wages connected with generating power and working locomotives. The train-mileage is as follows:—

	Half-year ended Dec. 31, 1910.	Half-year ended Dec. 31, 1909.
Steam passenger trains	197,195	184,828
Electric ,, ,, ...	1,689,618	1,632,749
Steam goods and mineral trains ..	111,291	81,516
Electric ,, ,, ...	5,532	886
Total	2,003,636	1,899,979

Prospectuses.—*Aron Electricity Meter, Ltd.*—An issue of £100,000 5 per cent. first mortgage convertible debentures in 1,000 debentures of £100 each is being offered at 97 per cent. The list is to close to-day. Part of the proceeds will be devoted to paying off the £23,000 of the 1901 issue of debentures which are still unredeemed; the remainder will be used for the extension of the business. The money is required for working capital in connection with the manufacture of taximeters.

Minnesota and Ontario Power Co.—The list was to close yesterday in an offer to $500,000 6 per cent. first mortgage gold bonds of $500 and $1,000 each at 100 per cent.

The *Cuban Telephone Co.* (incorporated under the laws of the State of Delaware, United States) is offering £300,000 5 per cent. first mortgage 40-year convertible gold bonds at 89 per cent., part of an authorised issue of £2,000,000.

Anglo-American Telegraph Co., Ltd.—The directors have resolved, after placing £10,000 to the credit of the renewal fund for the half-year, to recommend to the meeting on February 3rd the following dividends: A balance dividend of £1 10s. per cent. upon the ordinary consolidated stock for the year ending December 31st, 1910; a balance dividend of £1 10s. per cent. upon the preferred stock for the year; a first and final dividend of £1 10s. per cent. upon the deferred stock for the year, all payable on February 4th next, less income-tax. There will remain a balance of about £2,600 to be carried forward. The above dividends, together with those already paid, will amount to £3 15s. per cent. on the ordinary consolidated stock, £6 per cent. on the preferred stock, and £1 10s. per cent. on the deferred stock for the year 1910.

Liverpool Overhead Railway Co.—The accounts for the past half-year show an available balance of £11,672, and the directors have resolved to recommend payment of dividends at the rate of 5 per cent. per annum on the preference shares and 1½ per cent. per annum (for the six months) on the ordinary shares, leaving a balance of £4,246 to be carried forward.

British Electromobile Co., Ltd.—A petition for confirming the reduction of the capital from £21,072 to £20,072 is to be heard on February 4th.

Continental.—FRANCE.—A meeting of the shareholders of the Societe Lyonnaise des Forces Motrices du Rhone is about to be held at Lyons for the purpose of considering a proposal to increase the capital of the company from £1,000,000 to £1,200,000.

Bank Rate Changed.—The Bank Rate was yesterday reduced from 4½ to 4 per cent.

City and South London Railway Co.

The report of the directors for the half-year ending December 31st, 1910, states that the receipts from all sources amounted to £91,548 and the cost of working was £41,912, leaving a profit of £49,636. Inclusive of the balance brought forward, the net revenue account shows an aggregate total of £51,270. After making provision for the debenture stock interest, rent charge, and the transfer to the renewal fund of £1,500, a balance remains available for dividend of £35,039. Out of this sum the full dividend of 5 per cent. per annum is to be paid on the preference stocks 1891, 1896, 1901 and 1903, and a dividend at the rate of 1¾ per cent. per annum is to be paid upon the consolidated ordinary stock for the half-year, leaving a balance of £1,788 to be carried forward.

The passengers, exclusive of season ticket-holders, and dividends paid, in each of the last six half-years have been :—

Half-year.	Passengers (exclusive of season ticket-holders).	Receipts (including season tickets).	Dividend on ordinary stock.
Ended June, 1908	10,891,535	£83,475	1½ % p.a.
,, December, 1908 ..	10,631,336	81,360	1¾ ,,
,, June, 1909	11,227,179	84,246	1¾ ,,
,, December, 1909 ..	11,234,074	84,469	1¾ ,,
,, June, 1910	11,497,140	83,413	1¾ ,,
,, December, 1910 ..	12,004,807	86,103	1¾ ,,

The result of the six months' working enables the directors to recommend a dividend on the ordinary stock at the same rate as a year ago, and to carry forward £1,788 to the credit of the present half-year, against £712 in the corresponding period of 1909. The competition referred to in former reports continues as active as hitherto. The emergency staircase at the Brighton Co.'s end of the London Bridge subway is now in use. The construction of the high level subway between the public subways of the Central London Railway and the City and South London booking offices at the Bank Station is nearing completion. The Act authorising a low-level subway to connect the stations of the Metropolitan, Great Northern and City, and this railway at Moorgate Street received the sanction of Parliament, and preparations are being made for carrying out the work. The train-mileage for the half-year was 712,547, against 702,395 in the corresponding half of 1909.

Lanarkshire Tramways Co.

The directors report that, for the half-year ended December 31st, 1910, the revenue was £37,728, and the expenses were £19,933, leaving £17,794, less contributions payable to local authorities, £824 ; interest on debentures, £608 ; interest account, £1,115 ; amounts written off, as per revenue account, £698 ; leaving £14,549, plus £6,045 brought forward. Of the balance of £20,594 brought forward, £8,500 has been placed to reserve for depreciation, and the directors recommend that the balance be disposed of as follows : £10,290 to dividend at the rate of 6 per cent. per annum for the half-year on the issued share capital ; £305 to directors (being 10 per cent. of net profits after payment of 5 per cent. dividend for the year) ; and £1,499 to revenue new account. The traffic receipts for the half-year show an increase of £1,339, and the expenses an increase of £166, as compared with the receipts and expenses for the corresponding half-year of 1909. Over 14 million passengers were carried during the past year. The directors have transferred to reserve for depreciation £8,500, plus £1,260 for interest for the year on the balance at the credit of the account at December 31st, 1909. As the time allowed for the construction of extension lines to Mossend and Bellshill expires in August next, application is being made to Parliament to extend the time for a further period. Power is also sought to run trackless trolley cars. An extraordinary general meeting will be held on 31st inst., immediately after the general meeting, to approve the application.

Half-year ended.	Miles open.	Passengers carried.	Traffic receipts.	Average fare.	Car-mileage.	No. of cars.
June, 1909 ..	17·00	6,273,276	£31,623	1·20	807,960	53
December, 1909	21·28	6,896,172	35,887	1·25	936,288	60
June, 1910 ..	21·28	6,926,878	35,681	1·23	890,689	60
December, 1910	21·28	7,206,852	37,227	1·24	907,632	60

Central London Railway Co.

The directors' report for the half-year ending December 31st, 1910, to come before the half-yearly meeting at the Holborn Restaurant, on February 2nd, states that the capital expended during the half-year was £10,531. The financial results of the half-year's working were :—

	1910.	1909.	Inc. or dec.
Traffic receipts	£143,433	£140,609	+ £2,824
Miscellaneous receipts	12,156	11,073	+ 1,083
Gross receipts ..	£155,589	£151,682	+ 3,907
Less working expenses do.	88,529	89,323	— 794
Balance to net revenue account	£67,060	£62,359	+ £4,701

After providing for interest on the debenture stock, and other payments, the net revenue account shows that, including the amount brought forward from last half-year, there is an available balance of £94,371, as compared with £85,939 in the corresponding period. The directors recommend the declaration of the following dividends :—On the undivided ordinary stock at the rate of 3 per cent. per annum for the half-year; on the preferred ordinary stock at the rate of 4 per cent. per annum for the half-year ; on the deferred ordinary stock at the rate of 2 per cent. per annum for the *whole* year. These payments will require £50,726, leaving a balance of £43,645. The directors further recommend that £10,000 of this sum be credited to the reserve fund, increasing the total of that fund to £110,000, the remaining balance of £33,645 to be carried forward. The number of passengers carried since the opening of the railway, including those using through tickets and the cheap return tickets issued before 7.30 a.m., is as follows :—

Year.	Half-year ending June.	Half-year ending December.	Total.
1908	19,901,750	21,996,623	41,898,373
1909	18,989,109	19,394,285	38,383,394
1910	20,664,896	19,995,960	40,660,856

The increase of 601,675 passengers is principally due to the continued development of the "through" or exchange bookings which are in operation between the Central London and other underground railways in London. The traffic to and from the Japan-British Exhibition at Wood Lane has also contributed to the increase. A contract has been entered into for the extension of the company's railway from the Bank Station to Liverpool Street and Broad Street stations. The work is well in hand, and will be proceeded with as quickly as the special character of the construction will permit. The high level subway to connect the City and South London Co.'s Bank Station with the Bank Station of the Central London Co. is also being constructed, and will be available for use by the public in the course of the current half-year. At the conclusion of the ordinary general meeting, an extraordinary general meeting will be held, and a Bill "to empower the Central London Railway to construct new railways ; to confer running powers on that company over certain portions of the railways of the Great Western Railway Co. ; to authorise agreements between the said companies, and for other purposes" will be submitted for the approval of the shareholders. The object of this Bill is to obtain Parliamentary sanction for the making of a short extension (about ¼ mile in length) of the Central London Co.'s line from Wood Lane, to form a connection with the Great Western Co.'s Ealing and Shepherd's Bush Railway, authorised in 1905. It is intended by this means, and by the exercise of running powers over the Great Western Co.'s line, to provide a through service between the Ealing Broadway Station of that company, and the Central London Co.'s Liverpool Street Station, now in course of construction, thereby providing a direct route between the Great Western, Great Eastern, and North London systems.

The Siemens-Schuckert Group.

At the recent meeting of the Siemens & Halske Co., held in Berlin, various questions were raised by shareholders, one of whom complained of the inadequacy of the information contained in the annual report regarding the profits from the manufacturing departments and investments. In reply, it was stated on behalf of the directors that the report had been presented in the form which had been customary for years past, and it was added that, in harmony with all other large electrical undertakings, it was not considered appropriate to specialise the profits from different sources. The sum of £287,000 was held by the savings banks and deposit fund on behalf of the officials. Interest at the rate of 5 per cent. was paid, in order to strengthen the relations between the company and the officials. As to the amounts placed to the credit of the disposition fund in aid of the officials and workmen, it was necessary to make considerable allocations in order to have sufficient reserves for the constantly increasing obligations of the pension fund, as enough experience had not yet been gained as to whether the regular apportionment to the pension fund would suffice. Benevolent organisations on a large scale would be provided out of the fund, and the expenditure on the newly erected "Etterhaus" would be met out of the disposition fund. The electrical bank formed in conjunction with the A.E.G., had not hitherto come into operation. It was added that business in the new financial year was very good in the company's case, whilst an extraordinarily large increase of orders had been received by the Siemens-Schuckert Works.

At the meeting of the Elektricitäts Gesellschaft vorm Schuckert, of Nuremberg, it was announced that considerable extensions of works were necessary in the case of the Siemens-Schuckert Works, Ltd., and would require a large expenditure. The two proprietary companies—Siemens & Halske and the Schuckert Co.—proposed to meet the financial needs by making a permanent advance of £1,500,000 to the Siemens-Schuckert Works, at a fixed rate of interest, which would be taken into consideration on the distribution of the profits, and one half would be provided by each partner. The Schuckert Co. intended to raise its share capital by £500,000 for this purpose, and this would, with the premium on the issue of shares and the existing bank credit, be more than sufficient for the £750,000 required from the company. As to the position of the company in Bavaria and the prosperity of its own undertakings of long standing, it was stated that since the formation of the Siemens-Schuckert Works, Ltd., the Schuckert Co.'s profits had increased by £150,000, of which nearly £100,000 was derived solely from the Schuckert Co.'s own undertakings, only £50,000 of the increase being obtained from the Siemens-Schuckert Works.

Since the above meetings were held it has been announced that the new shares of £500,000 to be issued by the Schuckert Co., have been taken over by a syndicate, and are to be offered to existing shareholders at the price of 125 per cent. At the moment no information is available as to whether the Siemens & Halske Co. intends to propose an increase in share capital in order to furnish its share of £750,000 in the total of £1,500,000 required by the Siemens-Schuckert Works, Ltd. It is stated that negotiations by the latter are approaching completion for the acquisition of a site for the removal or extension of the Nuremberg works.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	£*	No. of wks.	Total to date. £	£*	Route miles open.	Inc.
Aberdeen	Jan. 18	2,511	+ 120	33	47,561	+ 964	..	..
Ayr	„ 21	353	+ 5	36	11,487	+ 423	8	..
Bath	„ 18	1,307	— 60	3	1,977	— 92	..	..
Belfast	„ 20	7,876	+ 570	42	178,309	+11,419	37	..
Birkenhead	„ 22	1,969	— 61	42	46,756	+ 943	13·68	..
Birmingham Corp.	„ 14	14,176	+ 439	41	285,092	+ 7,594	56·4	..
†Blackburn	„ 18	926	— 73	42⅔	45,584	— 1,150	14·12	..
Blackpool Corp.	„ 19	700	— 47	..	52,105	+ 522	..	..
Blackpool-Fleetw'd	„ 23	416	+ 2	3	711	— 10	..	..
Bolton	„ 12	4,413	+ 150	48	101,775	+ 1,819	26	..
Bournemouth	„ 18	2,695	— 159	41⅔	75,813	+ 5,261	21·95	..
Bradford	„ 7	10,684	+ 482	41	207,346	+ 9,320	54·81	..
Brighton	„ 22	1,442	— 33	42⅔	41,956	+ 414	9·5	..
Bristol	„ 20	11,126	— 127	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	Jan. 13	694	— 5	1⅔	429	— 8	3·65	..
Barnsley	„ 13	380	+ 20	„	280	+ 7	..	..
Barrow	„ 13	435	+ 27	„	378	+ 2	5·37	..
Cavehill	„ 13	116	+ 12	„	104	+ 11	..	..
Devonport	„ 13	902	+ 40	„	792	+ 29	8·85	..
Gateshead	„ 13	2,086	+ 102	„	1,810	+ 33	11·25	..
Gravesend	„ 13	370	— 9	„	326	— 6	6·5	..
Greenock	„ 13	1,169	+ 220	„	1,037	+ 185	7·25	..
Hartlepool	„ 13	429	+ 10	„	377	— 5	6·72	..
Kidderminster	„ 13	170	+ 5	„	152	+ 4	..	..
‡Leamington	„ 13	271	— 6	„	244	— 8	..	..
Merthyr	„ 13	356	— 18	„	305	— 21	2·9	..
Metropolitan	„ 13	15,067	+2,046	„	3,736	+ 1,877	22	..
Middleton	„ 13	593	+ 56	„	516	+ 54	8·5	..
Mid. Joint Com'tee	„ 13	11,487	+ 574	„	10,191	+ 328	..	..
Oldham—Ashton	„ 13	1,059	+ 51	„	933	+ 53	9·13	..
Peterborough	„ 13	204	+ 10	„	173	+ 8	5·31	..
Potteries	„ 13	3,773	+ 432	„	3,337	+ 327	29	..
Rothesay	„ 13	123	+ 8	„	105	+ 6	2·75	..
Southport	„ 13	462	+ 50	„	414	+ 37	8·17	..
S. Metropolitan	„ 13	1,410	— 75	„	1,264	— 65	..	..
Swansea	„ 13	1,930	— 67	„	1,808	+ 82	12·5	..
Tynemouth	„ 13	349	— 12	„	289	— 16	3·75	..
Weston-s-Mare	„ 13	88	— 25	„	31	— 26	3	..
‡Worcester	„ 13	504	+ 19	„	439	+ 8	5·75	..
Wrexham	„ 13	178	+ 1	„	153	— 2	..	..
Yorks. Wool. Dist.	„ 13	2,110	+ 170	„	1,857	+ 238	17	..
Miscellaneous	„ 13	398	+ 16	„	342	+ 10	..	..
Burnley	Jan. 21	2,385	+ 17	..	..	..	11·73	1
Burton-on-Trent	„ 23	483	— 1	42	11,649	+ 321	10	..
Bury	„ 22	2,095	+ 81	42⅔	49,973	+ 647	22·5	..
Cardiff	„ 21	4,115	— 184	43	96,193	+ 1,784	..	..
Carlisle	..	..	..	..	..	..	..	..
Chatham and Dist.	„ 19	1,555	— 27	4	2,089	— 193	14·98	..
Cork	„ 19	8 5	— 13	3	1,146	— 152	9·9	..
Croydon	„ 13	3,089	— 103	..	69,341	+ 3,370	11·25	..
Darlington	„ 21	370	+ 21	43	8,646	+ 722	..	..
Darwen	„ 20	444	+ 2	42	10,556	+ 29	4·36	..
Dover	„ 14	364	+ 24	41	9,257	+ 476	3·75	..
Dublin	„ 20	10,095	+ 120	..	14,544	— 156	54·25	..
Dundee	„ 18	2,200	— 85	35⅔	42,863	+ 519	15	..
East Ham	„ 21	1,187	+ 17	42	44,210	+ 1,957	7·87	..
Exeter	„ 20	520	— 45	42	13,600	— 591	5·5	..
Glasgow	„ 21	34,708	+2,199	..	603,284	+35,564	97·75	2·75
Hastings	„ 19	1,384	+ 165	..	..	..	..	..
Huddersfield	..	..	..	..	..	..	..	..
Hull	„ 21	5,512	+ 126	42	117,319	+ 5,929	14·5	..
Ilkeston	„ 19	224	— 7	42	5,422	— 220	..	..
Ipswich	„ 21	647	— 4	42	17,957	+ 949	10·5	..
Kilmarnock	„ 21	270	+ 4	36	5,534	+ 234	4·25	..
Lancashire United	„ 18	2,290	+ 24	3	3,194	— 83	39	..
Leeds	„ 21	13,365	+ 542	42	299,045	+10,486	57	..
Leicester	..	..	..	..	..	..	..	..
†Leith	„ 21	535	+ 4	35⅔	21,751	+ 77	3·72	..
Liverpool	„ 14	10,908	+ 246	2	22,282	+ 694	116	6·5
‡L.C.C.	„ 11	83,292	+4,810	..	1,716,582	+186,806	132·2	2·75
London United	„ 21	10,881	— 222	..	15,799	— 302	..	..
Lowestoft	..	..	..	..	..	..	..	..
†Manchester	„ 21	14,850	+ 681	42	654,806	+20,086	183	..
†Newcastle	„ 14	3,897	+ 198	..	168,824	+ 229	14·5	..
Newport	„ 14	1,289	+ 38	42	28,319	+ 1,070	14·5	..
Oldham	„ 22	3,420	+ 225	43	79,676	+ 1,449	23·5	·5
Pontypridd	..	..	..	..	..	..	..	..
†Portsmouth	„ 21	1,544	— 111	42	87,224	— 1,392	15·25	..
Preston	„ 18	1,313	— 15	42	30,872	— 289	..	..
Rotherham	..	..	..	..	..	..	..	..
Salford	„ 23	3,760	+ 241	42	199,488	+ 5,165	..	..
Sheffield	„ 22	12,129	+ 922	43⅞	262,551	+16,433	40	..
Southampton	„ 18	2,015	— 14	42	46,560	+ 1,438	..	..
Southend-on-Sea	„ 18	723	+ 3	42	24,860	+ 2,664	..	..
South Shields	„ 21	1,045	+ 49	42	23,856	— 40	..	..
Swindon	„ 18	254	+ 6	..	6,075	+ 326	..	..
Tyneside	„ 18	720	+ 16	3	940	— 71	..	..
Wallasey	„ 21	1,754	+ 161	42⅔	40,775	+ 1,779	..	..
†Walthamstow	„ 14	586	+ 12	41	29,407	+ 2,053	9	..
West Ham	„ 12	4,905	+ 248	41	102,610	+ 5,573	15·25	..
Wolverhampton	„ 18	1,853	+ 54	42	39,852	+ 3,993	14·25	..
Cen. London Rly.	„ 21	11,1·2	— 38	3	16,807	+ 135	6·32	..
City & S. Lon. Rly.	„ 22	7,151	+ 499	3	10,826	+ 757	7·26	..
Dublin-Lucan Rly.	„ 20	202	+ 3	3	280	— 22	7	..
G.N. and City Rly.	„ 21	3,200	+ 120	3	4,807	+ 152	3·5	..
L'pool Overh'd Rly.	„ 22	2,747	+ 174	..	4,198	+ 288	6·8	4·3
†Llandudno-Col. Bay	„ 13	105	— 5	6½	765	— 5	..	..
London Elec. Ry. Co.	„ 21	29,105	+1,660	3	43,935	+ 2,840	21·5	..
Mersey Railway	„ 21	4,131	+ 78	3	6,261	+ 123	4·5	..
Metropolitan Rly.	„ 22	31,681	+1,073	..	52,108	+ 1,704	24·5	..
Met. District Rly.	„ 21	23,789	+1,337	3	35,694	+ 2,955	24	..
Anglo-Argentine	„ 21	96,652	+12,858	..	447,965	+19,930	..	..
§Auckland	Dec.	16,171	+1,241	..	91,939	+ 9,363	23·3	1
Bombay (B.E.T.)	Dec. 22	5,940	+ 339	49	141,029	+ 9,913	..	..
§Brisbane	Nov.	18,730	+2,560	44	200,420	+20,428	..	..
§Brit. Columbia Rly.	..	..	..	..	..	..	..	..
Calcutta	Jan. 21	7,473	+ 613	..	..	..	..	..
§Cape Electric T.Ld.	..	..	..	..	..	..	..	..
§Kalgoorlie, W.A.	Dec.	3,792	..	52	42,829	..	20·5	..
§Lisbon	Dec.	1,699	+ 120	..	33,020	+ 1,510	..	..
Madras	Jan. 15	1,672	215	..	31,121	+ 58	..	..
§Montevideo	Dec.	26,674	+1,576	..	..	..	..	..
†Perth (W.A.)	Jan. 20	3,894	+ 203	..	4,880	+ 179	29	1

* Compared with the corresponding period of 1909. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Evening.

THERE is a certain amount of pleasure at any time in being able to unfold a cheerful tale, and the feeling is doubled when the cheerfulness follows a long period of dull depression. The patient reader probably understands that it is almost as weary work to write of stale markets as it is to read of them. But at last the clouds show rifts of sunshine, and though a fortnight or so of better prices do not make the blue sky of general activity, even those rifts are very pleasant when they do appear.

Electrical stocks and shares present a list of rises this week, which, taken in conjunction with previous quiet improvements, are decidedly satisfactory and encouraging. There are a few exceptions to the advances, but not of particular significance, and the tone—that vague, intangible thing which is so important, if often so misleading—to the Stock Exchange, is even better than prices.

The Home Railway dividend declarations up to the present have mostly justified the best expectations, and if the sequels, in prices, have disappointed some people, that is because the Stock Exchange practice of discounting events has been, perhaps, imperfectly grasped. It must be confessed that the City and South London has done none too well in only maintaining its previous rate of 1¾ per cent., and carrying forward £1,788, an increase of £1,076, nor is the report a particularly promising document, inasmuch as the prospect held out is but moderate, competition being the great bugbear. The Ordinary stock has slipped back 1½, and at 28½, *cum* dividend, the yield is just over 5 per cent. on the money.

Central Londons did not further respond when the dividend was declared of 3 per cent. on the Ordinary, giving the Deferred 2 per cent. for the year, the Preferred getting, of course, its regular 4 per cent. This is what the market had looked for, and the stocks are merely steady. It is stated that a scheme is on foot for linking up part of the Great Western's suburban system with the Central London, and this should prove of considerable value to the latter, which will become a highly important link between East and West when its extension to Liverpool Street is completed.

Metropolitan Consolidated had its spurt last week, and of the rise of 1½ then secured, ¼ has come off, lowering Districts at the same time. There have even been bargains done within the last few days in Great Northern and City Preferred shares, for which a buyer paid 17s. and a seller got 15s., the wide difference suggesting that somebody took what the Stock Exchange calls a "rasping turn." The Brighton Railway's increased dividend, from 4 per cent. to 4¾ per cent. on the Deferred, is due in no small part to the extra profits derived from the electrified part of the line.

Electricity Supply shares are a good market, and the dealers are in no particular hurry to sell, now that the inclination of the public to buy shares is becoming more and more patent. The principal rise in prices has been secured again by Metropolitan Ordinary, which have come up from 3⅞ on January 10th to 4½ now, thanks mainly to the Company's Parliamentary Bill for the acquisition of the Acton Urban District Council's undertaking. Chelsea's have risen 5s., Westminster's a further 2s. 6d., County of London the same, and London Electric Preference 2s. 6d. also, while City Lights and Smithfields are 5s. up. These are significant movements, as showing how investors, in their search for attractive shares, are at length beginning to recognise the possibilities which exist in the long-neglected electricity supply catalogue. Electric Constructions continue to rise in sympathy, both classes of shares being 2s 6d. better on the week.

Persistent "tips" are in circulation, emanating apparently from the provinces, to buy British Electric Tractions on the chance of the Preference shares receiving a dividend of 4s. a share, and in consequence, the price of the Preference has risen ¼. The market is one that can be manœuvred so easily by any determined group which may care to take it in hand, that we should not think of saying the prices will not go higher yet, but we have no hesitation in remarking that prospective buyers could probably make a much better selection in other shares. Metropolitan Electric Trams are good, the Ordinary and Deferred each being ⅛ harder. British Columbia Electric Railway Preferred rose 2 on the dividend announcement given on this page last week, and Calcutta Trams are being picked up, the Ordinary being another 5s. up, and the Preference half as much. Underground Electric Railway 6 per cent. income bonds jumped 3 on the favourable statement issued by the company, and although to take profits is always a temptation (and obviously a safe one to act upon), the possibility of further improvement leads us to think that those who bought much lower on advice offered here, will do well to retain at least part of the bonds

The principal event in the Telegraph market during the last week has been the announcement of the 30s. per cent. dividend on Anglo-American Telegraph Deferred, which was about what everyone supposed would be declared. A lively burst of renewed excitement carried Anglo "A" to a fraction over 29, from which it subsided to 28⅝, while the Preferred lost ¼. West India and Panama Ordinary have risen to 2⅛, on the idea that the company must benefit considerably by the construction of the Panama Canal, and the First Preference rose 5s. above their par price of £10. Direct United States shares have fallen 7s. 6d. The Eastern group keeps steady. Marconi's went back to 15s. after being better. National Telephones are rather easier.

Latin-Canadians keep strong, and Rio Trams, with a rise to 107, are one of the chief features. The industrial and manufacturing issues are quiet, a fall in Castner-Kellners not being surprising, seeing how consistent the previous rise had been. Babcock Ordinary are ⅛ down. India-rubber shares continued their improvement.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1907.	1908.	1909.	1910.	Closing Quotations Jan. 17th.	Closing Quotations Jan. 24th.	Business done week ended Jan. 24th, 1911. Highest	Lowest.	Rise + or Fall —	Present Yield per cent.
		*										£ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	5⅝ — 6⅛	5⅝ — 6⅛	..	..	..	Nil.
286,500	Do. 5 % Deb. Red. Iss. at 98 % script all paid	Stock	5 %	5 %	5 %	5 %	96 — 98	96 — 98	..	..	..	5 2 0
$255,196,000	American Telephone & Telegraph, Cap Stock ..	$100	8 %	8 %	8 %	..	146 —148	147 —149	..	..	+1	5 7 5
$53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	93 — 95	93½— 95½	94⅜	..	+ ½	4 3 9
558,460	Anglo-American Telegraph	Stock	3⅛%	£3 4s.	3⅛%	..	71 — 73	71 — 73	71⅛	..	..	4 19 4
3,220,770	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	..	114¼—115½	114¼—115½	115⅛	114¼	— ¼	5 4 1
3,220,770	Do. do. do. Deferred	Stock	1 %	8/-	25/-	..	28⅜— 28¾	28¼— 28⅜	28⅜	28 5/16	..	4 6 11
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	102 —104	102 —104	..	..	..	5 11 4
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	6 15/16 — 7 1/16 xd	6 15/16 — 7 1/16	7⅛	..	..	4 12 0
2,449,176	Commercial Cable, Stlng. 500 year 4% Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	84⅜— 86⅜	85 — 87	85⅝	..	+ ⅛	6 4 8
16,000	Cuba Telegraph	10	6 %	6 %	6 %	..	8⅞ — 9⅛	8⅞ — 9⅛	9 3/32	..	+ ⅛	5 12 8
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	..	16⅜— 17½	16⅜— 17¼	..	..	+ ⅛	5 0 6
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	..	3⅝— 3⅞	3¾ — 4	..	..	+ ⅛	5 14 3
6,000	Do. do. 10 % Cum. Pref. ..	10	10 %	10 %	10 %	10%	8¼— 8¾	8¼— 8¾	..	..	..	4 8 8
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	99 —101	99½—101½	..	..	+ ½	4 17 10
60,710	Direct United States Cable	20	4½%	4½%	4 %	..	15⅞— 16⅛	15⅞— 16	16⅛	15¾	— ⅛	4 9 1
	Direct W. India Cable, 4½% Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	5 2 2
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	..	134 —137 xd	134 —137	135⅜	134½	..	4 1 5
2,000,000	Do. 3½ % Pref. Stock..	100	3½%	3½%	3½%	3½%	83¼— 85½ xd	84 — 86	84⅛	84½	..	3 18 5
1,896,706	Do. 4 % Mort. Deb. Stock Red. ..	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	101⅛	100¾	..	5 6 8
300,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	..	12⅞— 13⅜ xd	12¾— 13¼	13⅛	12 15/16	..	3 18 5
752,400	Do. 4 % Deb. Stock..	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	101¼	..	..	
200,000	East. & S. Afric. Tel., 4 % Mt. Db. Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
181,127	Globe Telegraph and Trust	10	5⅞%	5⅞%	5⅞%	..	10½— 10⅝	10½— 10⅝	10⅝	..	..	5 9 5
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	..	13½— 13⅝	13½— 13⅝	13⅝	13⅛	..	4 8 1
150,000	Great Northern Telegraph, of Copenhagen..	10	20 %	18 %	18 %	..	31½— 32½	31½— 32½	33	..	..	5 10 9
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	..	54 — 56	54 — 56	55⅛	..	..	5 17 0
$41,380,400	Mackay Companies Common	$100	4 %	4 %	4½%	..	94 — 97	94 — 97	..	..	..	4 7 8
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	77 — 79	77 — 79	..	..	..	5 1 3
394,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	⅛— ⅛	⅛— ⅛	16/3	15/-	+ 1/16	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	6 %	6 %	6 %	..	1— 1	1— 1	18/3	..	..	6 0 0
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	39/32— 40/32	39/32— 40/32	..	..	..	5 11 1
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	..	106½—107½	106½—107½	107	106½	..	5 11 10
3,725,000	Do. do. Def. Stock	100	6 %	6 %	6 %	..	127 —129	126 —128	128	126	—1	4 13 9
15,000	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	..	10⅜— 10⅞	10 — 10⅜	..	..	— ⅛	5 11 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	..	10⅜— 10⅞	10 — 10⅜	..	..	— ⅛	5 11 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	..	5⅛— 5⅜	5⅛— 5⅜	5 5/16	..	..	4 7 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 —100	98 —100	98¼	98	..	3 10 0
1,983,593	Do. do. 4 % Deb. Stock Red.. ..	100	4 %	4 %	4 %	4 %	98 —100	98 —100	98⅜	98¼	..	4 0 0
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid..	1	8 %	8 %	8 %	..	1⅜— 1 11/16	1⅜— 1 11/16	..	..	..	4 14 10
50,000	Do. do. do. 6 % Cum. Pref. ..	1	6 %	6 %	6 %	..	1⅜— 1 15/16	1⅜— 1 15/16	..	..	..	4 7 3
195,955	Do. do. do. 4 % Red. Deb. Stock..	100	4 %	4 %	4 %	4 %	87 — 89	87 — 89	87½	..	..	4 9 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	100	4 %	4 %	4 %	4 %	97 — 99	97 — 99	..	..	..	4 0 10
11,839	Reuter's	8	5 %	5 %	5 %	..	7⅜— 8	7⅜— 8	..	..	..	5 0 0
145,955	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	96⅛— 98⅛	96⅛— 98⅛	97⅛	..	..	4 11 5
3,042	Submarine Cables Trust..	Cert.	6 %	6 %	6 %	..	132 —135	132 —135	..	..	..	4 8 11
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	7 3/32 — 7 1/16	7⅛ — 7⅜	7 7/32	7 1/16	+ 1/16	5 6 8
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5⅛ — 5⅜	5⅛ — 5⅜	5 11/16	..	..	4 6 11
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2½	2½%	2½%	2½%	..	1¼ — 1½	1¼ — 1½	..	..	..	4 3 4
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	97 — 99	97 — 99	..	..	..	4 0 10
207,980	Western Telegraph, Ltd., Nos. 1 to 207,930 ..	10	7 %	7 %	7 %	..	13½— 14	13½— 14	13⅞	13⅜	..	4 17 5
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	99 —101	99 —101	..	..	..	3 19 3
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	..	2 — 2⅛	2 13/16 — 2 17/32	53/9	46/3	+ 3/8	Nil
34,563	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	6 %	9⅜— 10⅛	10 — 10½	10⅝	10	+ ¼	5 14 3
4,669	Do. do. 6 % Cum. 2nd Pref.	10	£2 6	15 %	14½%	..	8⅝— 9¼	8⅞— 9¼	..	..	..	6 9 9
80,000	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —102	100½—102½	..	..	+ ⅛	4 17 7

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

640,000	Anglo-Argentine Trams, 5% Cum. 1st Pref. 1 to 640,000	5	..	..	5 %	..	4 13/16—5 1/16	4 13/16— 5 1/16	99/4½	97/6	..	4 19 8
500,000	Do. 5 % 2nd Pref., 800,000 to 1,800,000	5	..	..	5 %	..	4 5/16— 4 7/16	4 5/16— 4 7/16	90/-	87/6	..	5 6 8
4,465,674	Do. 4 % Deb. Stock	Stock	..	4 %	4 %	4 %	91 — 93	91 — 93	92½	91⅝	..	4 6 0
332,387	Auckland E. Trams, 5 % 1st Mort Deb. Stock ..	100	5 %	5 %	5 %	5 %	101½—103½	101¼—103¼	..	..	..	4 16 7
880,000	Babcock & Wilcox, 1 to 880,000	1	20 %	20 %	24 %	..	5 9/16 — 5 11/16	5⅝ — 5⅝	5 23/32	5 21/32	— 1/32	4 3 8
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	..	1⅛— 1⅛	1⅛— 1⅛	..	..	..	4 0 0
500,000	British Columbia E. Rail Def. Ord. Stock	100	8 %	8 %	8 %	..	145 —148	145 —148	147½	145½	..	4 10 11
400,000	Do. Pref. Ord. Stock	100	5 %	6 %	6 %	..	126 —130	128 —132	130	128½	+2	4 8 6
400,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	..	109 —112 xd	110 —113	112	110½	+1	4 9 3
233,000	Do. 4½ % 1st Mort. Deb., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 —104	102 —104	..	..	..	4 8 7
212,600	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104 xd	101 —104	..	..	..	4 6 7
133,301	British Electric Traction	10	Nil	Nil	Nil	..	1⅛— 1⅜	1⅛— 1⅜	30/-	29/4½	..	Nil
161,437	Do. do. 6 % Cum. Pref.	10	3 %	1½%	Nil	..	3⅜— 4⅛	3¾ — 4¼	80/-	76/3	+ ⅜	Nil
1,473,658	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	91 — 95	91 — 95	93	..	..	5 5 3
528,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	73 — 78	73 — 78	74½	..	..	5 15 5
100,000	British Insulated and Helsby Cables	5	10 %	10 %	10 %	..	6⅞— 7⅛	6⅞— 7⅛	..	..	..	6 17 11
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	..	5⅞— 6⅛	5⅞— 6⅛	..	..	..	4 16 0
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	99 —102	100 —102	..	..	+ ⅛	4 8 3
201,579	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 75,000	5	Nil	Nil	Nil	..	⅛— ⅛	⅛— ⅛	6/-	5/6	..	Nil
1,316,358	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	57 — 60	57 — 60	57	..	..	6 13 4
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	7/8 — 11/16	7/8 — 11/16	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	Nil	Nil	..	0 — ⅛	0 — ⅛	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref... ..	2	Nil	Nil	Nil	..	0 — ⅛	0 — ⅛	..	..	..	Nil
125,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	37 — 42	37 — 42	40	..	..	10 14 4
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	21 — 25	21 — 25	..	..	..	18 0 0
137,610	Calcutta Trams, 1 to 137,610	5	6 %	4½%	4½%	..	4⅜— 5⅛	5 — 5⅛	5⅛	5 1/16	+ ⅛	4 1 10
45,804	Do. 5 % Cum. Pref., Nos. 1 to 29,380..	5	5 %	5 %	5 %	..	4⅛— 5	4⅞— 5⅛	..	..	+ ⅛	5 0 0
350,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	96 — 99	96 — 99	..	..	..	4 10 11
35,000	Callender's Cable Construction shares	5	15 %	15 %	10 %	..	9⅛— 9⅜	9⅛— 9⅜	..	..	..	5 0 0
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	4 13/16— 5 1/16	4⅞— 5	..	..	— 1/16	4 18 9
300,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102 —104	102 —104	..	..	..	4 6 7
491,222	Cape E. Trams., 1 to 491,222	1	Nil	Nil	Nil	..	⅛— ⅛	⅛— ⅛	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	12 %	12½%	17½%	..	3 1/32 — 3 3/32	3 1/32 — 3 3/32	64/9	61/3	— 3/32	5 10 3
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4 %	4½%	4½%	105 —108	105 —108	..	..	..	4 3 4
1,890,690	Central London Railway, Ord. Stock	Stock	3 %	3½%	3 %	3 %	64 — 66	64 — 66	65½	..	..	4 10 11
554,655	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	85 — 87	85 — 87	85½	..	..	4 12 0
554,655	Do. do. Def. do.	Stock	2 %	2½%	2 %	2 %	46 — 48	46 — 48	48	46½	..	4 3 4
1,480,000	City and South London Railway	Stock	2½%	1½%	1½%	1½%	29½— 30½	28 — 29	30½	28½	—1½	5 3 5
85,000	Crompton & Co., Nos. 1 to 85,000	8	5 %	Nil	Nil	..	⅛— ⅜	⅛— ⅛	..	..	..	Nil
100,000	Do. 5 % 1st Mort. Reg. Debs., 900 of £100, and 901 11,000 of £50 Red	..	5 %	5 %	5 %	5 %	70 — 80	70 — 80	..	..	..	6 0 5

* Unless otherwise stated, all shares are fully paid. ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued.*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1907.	1908.	1909.	1910.	Closing Quotations Jan. 17th.	Closing Quotations Jan. 24th.	Business done week ended Jan. 24th, 1911. Highest	Lowest	Rise + or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	6 %	5 %	..	19 — 15/16	19 — 15/16	19/9	..	.	5 6 8
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	..	15/16 — 1 1/16	15/16 — 1 1/16	..	..	..	6 0 0
271,080	Do. do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	97 —100	97 —100	..	..	..	4 10 0
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	..	12½ — 13½	12½ — 13½	..	..	..	4 8 11
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	2½ %	Nil	Nil	..	0 — 1/4	0 — 1/4	..	..	..	Nil
17,139	Do. "A" shares, 01—017,139	5	2½ %	Nil	Nil	..	1 — 1½	1 — 1½	..	..	..	Nil
807,895	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	61 — 66	61 — 66	..	..	..	6 1 3
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	77 — 80	77 — 80	..	..	..	6 5 0
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	..	3/16 — 7/32	3/16 — 7/32	16/6	14/9	+ 1/4	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	..	1 5/16 — 1 7/16	1 5/16 — 2 1/16	38/9	..	+ 1/8	6 16 7
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	8 — 8½	8 — 8¼	8 1/16	..	..	5 17 8
200,000	Do. do. 4 % Mort. Deb.	Stock	4 %	4 %	4 %	4 %	80 — 84	80 — 84	..	..	..	4 15 3
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	½ %	Nil	Nil	..	3/4 — 1	3/4 — 1	..	..	..	Nil
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10¼ — 10¾	10¼ — 10¾	..	..	..	6 10 3
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103½	102 —103½	..	..	..	4 16 10
40,000	Henley's (W.T.), Telegraph Works, Ord.	5	15 %	15 %	15 %	..	12⅜ — 12⅝	12⅜ — 12⅝	12⅜	12⅜	..	5 18 6
40,000	Do. do. 4½ % Pref.	5	4½ %	4½ %	4½ %	..	5 — 5¼	5 — 5¼	5 1/16	..	..	5 4 8
150,000	Do. do. 4½ % Mort. Deb Stock	Stock	4½ %	4½ %	4½ %	4½ %	107 —109	107 —109	..	..	..	4 5 9
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	10 %	10 %	10 %	..	15½ — 16	15⅝ — 16¼	16	..	+ ⅛	6 4 0
37,500	†Liverpool Overhead Railway, Ord.	10	½ %	Nil	Nil	..	1⅜ — 1½	1 3/16 — 1 5/16	..	..	+ 1/16	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	..	6⅝ — 7¼	6¾ — 7¼	..	..	..	6 15 7
600,070	London United Trams. (1901) 1 to 50,007	10	3 %	Nil	Nil	..	1⅜ — 2⅜	1⅜ — 2⅜	..	..	..	Nil
399,930	Do. do. 60,008 to 100,000	10	3 %	Nil	Nil	..	1⅜ — 2⅜	1⅜ — 2⅜	..	..	..	Nil
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	3⅓ %	Nil	..	1⅜ — 2⅜	1⅜ — 2⅜	..	..	..	..
1,649,930	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	65 — 69	65 — 69	66	..	..	5 15 11
5,732,062	Metropolitan Consolidated	100	¾ %	¾ %	1 %	1¼ %	42¼ — 42⅝	42 — 42⅛	42⅛	41½	— ½	2 12 11
2,640,914	Do. Surplus Lands	100	2¾ %	2¾ %	2¾ %	2¾ %	64 — 66	64 — 66	65⅛	..	..	4 3 4
8,235,000	Do. District	100	Nil	Nil	Nil	..	27⅞ — 28¼	27 — 27⅛	27⅛	27 1/16	— ⅜	Nil
391,337	Metropolitan Electric Trams., Ord.	1	..	4½ %	5 %	..	3/4 — 1	13/16 — 7/8	20/3	18/-	+ 3/4	4 17 7
314,016	Do. do. Defd.	1	Nil	Nil	Nil	..	3/16 — 5/16	3/16 — 5/16	4/3	3/3	+ 3/16	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	3/4 — 1	3/4 — 1	19/6	18/6	..	5 0 0
595,600	Do. do. 4½ % Deb. Stock Red.	100	4½ %	4½ %	4½ %	..	100 —102	99 —101	101	100½	+1	4 9 1
$10,823,200	Mexico Trams Co., Common Stock	..	..	..	..	6 %	123¾—125½ xd	124 —126	..	..	+ ⅜	4 15 3
$9,000,000	Do. 1st Mort. 50-year 5 % Gld. Bds.	..	..	5 %	5 %	..	98½ — 99½	98½ — 99½	99½	98⅜	+ ¼	5 0 6
245,500	Potteries Electric Traction	1	4 %	Nil	2 %	..	1/16 — 1/8	1/16 — 1/8	..	..	..	6 8 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	1/8 — 3/16	1/8 — 3/16	..	..	..	7 5 5
245,000	Do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	80 — 83	80 — 83	..	..	..	5 8 5
37,350	Telegraph Construction and Maintenance	12	17½ %	15 %	17½ %	..	38½ — 40½	38½ — 40½	39	..	..	5 1 10
140,000‡	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	99½—101½	99½—101½	..	..	..	3 18 10
1,000,000	Underground Electric Railway, 5 % Prior Lien	..	..	5 %	5 %	..	102½—103½	102½—103½	103½	102⅞	..	4 16 7
2,800,000	Do. do. 4½ % Bonds	..	..	4½ %	4½ %	..	95 — 97	95 — 97	95⅛	95½	..	4 12 9
4,900,000	Do. do. 6 % Income Bonds	..	..	..	..	1 %	39 — 41	42 — 44	43⅜	41	+8	2 5 6
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	10 %	5 %	Nil	..	3/8 — 7/16	1/4 — 3/8	..	..	..	..
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	6 %	6 %	3 %	..	1 — 1½	1 — 1½	..	..	..	10 0 0
245,495	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	55 — 65	55 — 65	..	..	..	6 3 1

ELECTRICITY SUPPLY COMPANIES.

80,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10 %	..	6⅞ — 7⅛	6⅞ — 7⅛	7 3/16	6 15/16	..	6 15 7
9,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	..	6¾ — 7⅛	6¾ — 7⅛	7¼	7 1/16	..	4 14 11
400,000	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 —103	99 —103	..	..	..	3 17 8
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	..	3⅝ — 4¼	3⅝ — 4¼	81/3	78/1½	..	5 19 5
80,000	Do. do. 4½ % Cum. Pref.	5	4½ %	4½ %	4½ %	..	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½ %	4½ %	4½ %	..	3⅝ — 4¼	3⅝ — 4¼	75/7½	..	..	5 7 6
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	95 — 97	95 — 97	..	..	..	4 2 6
49,436	Chelsea Electricity Supply, Ord.	5	4½ %	4½ %	4½ %	..	3½ — 3⅝	3½ — 4	76/3	..	+ ½	5 12 6
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½ %	4½ %	4½ %	4½ %	98 —100	98 —100	..	..	..	4 10 0
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	7 %	..	11½ — 11⅝	11½ — 12	11⅝	11⅜	+ ½	5 16 8
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	..	12 — 13	12 — 13	..	..	..	4 12 4
400,000	Do. 5 % Db. Stk.	Stock	5 %	5 %	5 %	5 %	118 —122	118 —122	..	..	..	4 2 0
800,000	Do. 4½ % 2nd. Db. Stk.	100	4½ %	4½ %	4½ %	4½ %	99 —102	99 —102	100½	..	..	4 8 3
50,000	County of Durham Electrical Power, Ord.	5	2 %	Nil	Nil	..	1⅝ — 2	1⅝ — 2	..	..	..	Nil
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	..	2⅝ — 3¼	2⅝ — 3¼	..	..	..	7 16 10
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	5 %	5 %	5 %	92 — 94	92 — 94	..	..	..	5 6 5
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	..	7⅛ — 7¼	7⅜ — 7⅝	7⅜	..	+ ⅛	6 7 0
55,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	..	10⅜ — 11	10⅛ — 11	10⅛	..	..	5 9 1
400,000‡	Do. do. 4½ % Deb. Stock	Stock	4½ %	4½ %	4½ %	4½ %	104 —107	104 —107	106	..	..	4 4 1
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½ %	4½ %	4½ %	4½ %	98 —101	98 —101	100½	100⅛	..	4 9 1
80,000	Edmundson's Electric Corporation, Ord. Shares	5	Nil	Nil	Nil	..	1/16 — 3/16	1/16 — 3/16	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	Nil	Nil	Nil	..	1/8 — 1/4	1/8 — 1/4	30/-	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½ %	4½ %	4½ %	4½ %	72 — 75 xd	72 — 75	..	..	..	6 0 0
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	5 %	5 %	..	83 — 84	82 — 84	..	..	..	5 19 1
10,000	Folkestone, 1 to 10,000	5	5½ %	5½ %	5½ %	..	4⅞ — 5⅛	4⅞ — 5⅛	..	..	..	5 12 10
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	..	4⅞ — 5⅛	4⅞ — 5⅛	..	..	..	4 11 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	99 —102	99 —102	..	..	..	4 8 3
15,000	Hove, 1 to 15,000	5	8½ %	8½ %	8½ %	..	6⅝ — 7⅛	6⅝ — 7⅛	..	..	..	5 19 4
$1,976,000	Kaministiquia Power Co., 5 % Gold Bnds.	100	..	5 %	5 %	..	101 —103	101 —103	..	..	..	4 17 1
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	8 %	8 %	..	6½ — 6⅞	6½ — 6⅞	..	..	..	4 17 6
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	93 — 95	93 — 95	..	..	..	4 4 3
11,000	London Electric Supply Corporation, Limited, Ord.	3	2½ %	3 %	2 %	..	1⅞ — 1⅞	1⅞ — 2	..	..	+ ⅛	3 0 4
70,000	Do. do. do. 6 % Pref.	5	6 %	6 %	6 %	..	4⅛ — 5⅛	4⅛ — 5⅛	98/9	..	..	5 17 1
382,355	Do. do. 4 % 1st Mort. Deb. Stock Red.	Stock	4 %	4 %	4 %	4 %	90 — 93	90 — 93	90½	..	..	4 6 0
200,000	Metropolitan Electric Supply, 1 to 100,000	5	6½ %	5 %	5 %	..	3⅞ — 4⅛	4¼ — 4⅜	94/6	86/3	+ ⅜	5 5 3
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½ %	4½ %	4½ %	..	4⅛ — 4½	4 1/16 — 4 7/16	85/-	..	+ 1/16	4 10 2
235,000	Do. 4½ % 1st Mort. Deben. Stock	Stock	4½ %	4½ %	4½ %	4½ %	100 —103	100 —103	103	..	..	4 7 5
248,000	Do. 3½ % Mort. Deben. Stock Redeem.	Stock	3½ %	3½ %	3½ %	3½ %	82 — 85	82 — 85	..	..	..	4 1 5
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	100	5 %	5 %	5 %	5 %	87½ — 88½	87⅝ — 88½	87⅞	..	..	5 13 0
13,585,000	Do. Light and Power Co., Ltd., Common	$100	4 %	3½ %	4 %	..	87½ — 89½ xd	88⅜ — 90½	90	87½	..	4 9 5
$2,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	7 %	7 %	..	107½—109½	108 —110	109	108½	+ ½	6 7 3
12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	100	..	5 %	5 %	5 %	95¼ — 96¼	95⅞ — 96⅞	96⅞	96	+ ⅜	5 3 4
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½ %	4½ %	4½ %	4½ %	96 — 98	96 — 98	..	..	..	4 11 10
180,491	Newcastle-on-Tyne, 1 to 137,500	5	8 %	2½ %	..	..	3⅜ — 4⅛	3⅜ — 4⅛	..	..	..	2 12 9
137,500	Do. 5 % Pref., 1 to 137,500	5	5 %	5 %	5 %	..	4⅛ — 4¼	4⅛ — 4¼	..	..	..	5 2 7
150,000	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,500	100	..	..	5 %	..	97⅛ — 99⅛	97⅛ — 99⅛	..	..	..	5 0 6
10,852	Notting Hill Electric Lighting	10	7½ %	7 %	..	..	11⅛ — 12⅛	11⅛ — 12⅛	..	..	..	5 12 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 ..	7 %	..	6¼ — 6¾	6¼ — 6¾	6⅜	..	..	5 3 8
119,694	River Plate Elcty. Co. Ord.	Stock	6 %	8 %	9 %	..	228 —238	228 —238	..	..	..	3 15 8
100,000	Do. do. 6% Non Cum. Pref.	Stock	6 %	6 %	6 %	..	103 —113	103 —113	..	..	..	5 6 2
200,000	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	101½—103½	101¼—103½	..	..	..	4 16 7
40,000	St. James' and Pall Mall Electric Light, Ord.	5	10 %	10 %	10 %	..	7⅞ — 8	7⅞ — 8	7⅞	..	..	6 5 0
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	..	6¾ — 7⅛	6¾ — 7⅛	7⅛	..	..	4 0 6
150,000‡	Do. do. 3½ % Deb. Stock Red.	100	3½ %	3½ %	3½ %	3½ %	85 — 87	85 — 87	..	..	..	3 19 7
12,000	Smithfield Markets Electric Supply, Ord.	5	Nil	Nil	Nil	Nil	1⅝ — 2	1⅝ — 2¼	..	..	+ ¼	Nil
65,000	South London Electric Supply, Ord.	4	4 %	5 %	5 %	..	3 — 3⅜	3 — 3⅜	..	..	..	5 19 5
180,100	Do. do. 5 % 1st Mort. Deb.	100	..	5 %	5 %	5 %	97½—100½	99 —102	..	..	+1½	4 18 0
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½ %	2½ %	..	..	3/8 — 1/2	3/8 — 1/2	..	..	..	Nil
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	..	1⅝ — 1¾	1⅝ — 1¾	..	..	..	6 16 7
224,520	Do. do. 4½ % 1st Deb. Stk.	100	4½ %	4½ %	4½ %	4½ %	96 — 99	96 — 99	..	..	..	4 10 11
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	1 — 1	1 — 1	..	..	..	20 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	1⅜ — 2¼	1⅜ — 2¼	..	..	..	11 2 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½ %	4½ %	4½ %	4½ %	80 — 83	80 — 84	..	..	+ ½	5 7 2
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 808,000	1	..	5 %	..	..	3/8 — 7/16	3/8 — 7/16	..	..	..	5 14 3
100,020	Westminster Electric Supply, Ord.	5	10 %	10 %	10 %	..	7⅞ — 8¼	7⅞ — 8¼	8¼	..	+ ⅛	6 1 3
51,279	Do. do. 4½ % Cum. Pref. (Reduced from 5% since 31st Dec., 1905)	5	4½ %	4½ %	4½ %	..	5 — 5⅛	5 — 5⅛	5 1/16	..	..	4 3 9

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

Bank rate of Discount 4½ per cent. December 1st, 1910.

METERS AND METER-READERS.

By H. E. GOODY.

THE meter-reader cares very little about the internal economy of the instrument he has to read. He is satisfied if he can read the meter easily, without undue exertion. And it must be clearly understood that in this article the writer has purposely shut his eyes to all considerations of accuracy, reliability, cost, or appearance, and has simply concentrated on the single question of "readableness."

Unfortunately, the makers do not appear to have troubled themselves at all about this very essential quality; and meter-readers are put to a great deal of quite unnecessary exertion and delay in reading meters which the makers seem to have done their best to render unreadable. To have to labour such an obvious point at this stage of electrical progress is almost laughably absurd; but the necessity can be vouched for by anyone who has spent a few years in a central-station meter department.

Meters are made accurate because the Board of Trade insists that, within certain limits, they shall be accurate; they are made substantial and durable, because the supply company does not want to have to replace them after a very short working life. They are not made readable (or most of them are not) because no powerful interest has hitherto thought fit to insist on this extremely important quality.

It is not sufficient that one should be able to read a meter with the eyes on a level with, and about 6 in. from, the dial. Meters are often fixed in places such as coal-cellars or store cupboards where it is almost impossible to get near them. In many cases the tenants of flats and small houses do not possess step-ladders. The ideal meter, then, should be readable from a distance of, say, 6 ft., at a height of 8 ft. from the ground.

These conditions are fulfilled, so far as the writer knows, in only one meter, viz., the old type of Ferranti meter. There is nothing very special about this meter; nothing, that is to say, which could not easily be applied to any other type. The dials are very heavily graduated in black against a perfectly white ground, the pointers are substantial pieces of metal, and the case just below the dial is cut away, so that the meter can easily be read from the floor. That is all there is to it; but for all the simplicity of the problem, no other maker has put upon the market a meter which can approach the Ferranti in point of readableness.

Other meters fail to achieve this quality in a variety of ways; and it is rather astonishing that none has attained by accident what it could not get by premeditated design.

The Aron-Turnfield meter, for example, has an excellently arranged dial of the cyclometer type. The figures are large and well defined, and only a small thing stands between this meter and the first place in order of readability. The edge of the case just below the dial is slightly "lipped," and this lip effectually prevents the figures from being seen, unless the reader's eyes are level with them. In the case of a meter of this type, fixed close to the ceiling in a house where there is no step-ladder, the inspector may be delayed ten minutes in building a scaffolding to the necessary height.

The small B.T.-H. alternating-current meter, with the three dials (units, tens and hundreds) arranged triangularly, has been responsible for a good many "misreads"; and the time wasted in deciphering the readings of these meters must be simply appalling. The triangular arrangement of the dials is in itself confusing, and the confusion is not at all lessened by the fact that the hundreds dial is at the bottom right-hand corner, and the units dial at the apex, of the triangle.

The B.T.-H., Electrical Co.'s and Siemens cyclometer dial meters are all afflicted in the same way. The figures are printed in black, but the material on which they are printed is not white, but a dirty greyish colour, so that the definition is very poor indeed from even a short distance. The apertures in which the figures appear are too small, and a very slight misplacement is sufficient to hide, perhaps, an essential portion of the figure. The Electrical Co.'s and Siemens meters have also a slight lip immediately beneath the figures, so that an oblique view is nearly impossible.

The old type of B.T.-H. meter with the large bulging case is almost obsolete; but it is an excellent example of a meter constructed, apparently, in total oblivion of the fact that there is a very important operation known as "taking the index."

The Westinghouse and Chamberlain & Hookham meters may be bracketed next to the Ferranti in order of readableness, but the Aron clock meter is a bad sinner in this respect, and simply because the dials are not marked distinctly enough.

It is surely time that there was some attempt at the standardisation of electricity meter dials. In having to read a dozen different types of dial, our inspectors are at a serious disadvantage *vis-à-vis* of their gas *confrères*. Apart from the individual difficulties of particular meters, this extensive variety of dials greatly increases the liability of error.

The essential points in an ideally readable meter are few and extremely obvious. In the case of the ordinary graduated dials, they should be at least 1 in. in diameter—more if possible. The graduations shonld be heavily marked in black against a perfectly white ground. The pointers (of which the business end should be easily distinguishable from the tail—but why have a tail?) should also be painted black; their size, of course, will depend on the diameter of the dials. There should be an ample margin between the dials and the surrounding edge of the case. If ornament is necessary, on no account should it take the form of a lip on the edge of the case surrounding the dials. All fractional dials or figures should be clearly distinguished from the others, either by being made smaller or by being outlined in red or any other suitable colour. Almost the same remarks apply in the case of cyclometer dials. In addition, in these meters the apertures through which the figures appear should be a lot larger than the figures themselves.

The only test for the readableness of meters is the one hinted at above. Fix the meter in a perfectly dark cellar, 8 ft. from the ground. Stand on the ground 6 ft. away and strike a match; if the meter can be read under those conditions, it may be considered to have passed the test. If the meter cannot be read, or only with great difficulty, experiment with others, until success is attained.

The writer has no hesitation in saying that if station engineers insisted that all meters purchased should fulfil the conditions indicated, it would be found that the small amount of extra trouble entailed would be more than counterbalanced by the increased celerity and accuracy of the quarterly meter-reading.

Belgian Enterprise in Russia.—A large programme with a comparatively modest capital is proposed by the Société de Tramways et Electricité, which has been formed in Brussels with an ordinary share capital of £60,000, capable of being increased at the directors' will to £128,000. In addition 24,000 founder shares of no minimum value have been created, and power is also taken to make an issue of £200,000 in bonds. The principal object of the company is the purchase of shares in Russian horse-tramway companies, with the object of the lines being converted to electric traction. The first to come under consideration are the Samara tramways and the realisation of a concession granted to a private individual for town and suburban tramways in Sosnowice. The new company has already taken over a number of shares in a Russian traffic company which works horse tramways in various parts of the south of Russia.

Dinner.—The firm of W. Canning & Co.—MESSRS. T. R. and E. R. CANNING—entertained at dinner on Saturday, January 14th, at the White Horse Hotel, Congreve Street, Birmingham, the members of the Sick and Dividend Societies connected with their Great Hampton Street staff and works and Snow Hill Engineering Works, Birmingham, when 182 male employés sat down. Advantage was taken of the occasion to make several presentations for long service. Mr. T. R. Canning spoke feelingly of the pleasure it gave them to recognise loyal and faithful service. Mr. W. J. Kember, who has travelled for the firm over 20 years, and is well known to those engaged in the electro-plating and polishing trade throughout the United Kingdom, was presented with a gold watch suitably inscribed, and, in response, he related some interesting facts about the firm when he first entered its service, and illustrated its remarkable growth by saying he could then very easily count the staff—which was one clerk—while on Saturday morning he made an effort to count the clerks, but gave it up. Other presentations were made to Thomas Worral, a foreman in the calico mop manufacturing department, for 22 years' service; J. Adams, head stableman, for 20 years' service, and John Tandy, warehouseman, for 22 years' service. Another long-service presentation will be made at the lady clerks' whist drive, to be held shortly, when Miss Green, cashier, will be the recipient, having a record of 22 years.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING DECEMBER, 1910.

THE closing month of 1910 left little to be desired from either the electrical exporter's or importer's point of view, judging by the excellent figures recorded.

The exports for the month totalled just over three-quarters of a million, due to the inclusion of a large telegraphic export amounting to some £436,000 in value. Even neglecting the latter, the remaining £315,822, representing general business, has rarely been exceeded, and it represents a great advance on the £285,000 monthly average of the exports (minus telegraphic material) obtaining during the year.

The imports total of £260,425 is the highest so far recorded by us, and compares with £223,955 in the previous month, and £189,000, the monthly average obtaining during 1910. The re-exports, at £21,326, are somewhat below those of November. While the huge telegraphic export primarily contributed to the splendid total of the exports, both the electrical machinery and cable exports, amounting to £150,000 and £80,840 respectively, were also above the normal; the high import total may similarly be traced to abnormal purchases of lamps, machinery and telephonic goods, principally from Germany.

Nominally, Portuguese W. Africa was our best customer during the month, Brazil coming next, and from a similar cause, with India, Japan and our South African and Australian Colonies following.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Country receiving exports and importing.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric lamps and parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	182	345	90	167	433	2,273	...	266	...	292	1,196	5,244
Germany and German East Africa	333	328	81	403	647	1,112	100	64	...	...	26	3,094
Netherlands, Java and Dutch Indies	350	1,294	107	87	171	586	...	10	...	42	53	2,700
Belgium	109	563	27	66	41	1,550	28	...	8	2,950	49	5,391
France and French Africa	2,711	78	928	138	2	2,603	40	3	...	153	3,902	10,558
Portugal	84	10	58	20	...	342	315	...	7	599	41	1,476
Spain, Canary Isles and Spanish N. Africa ...	248	52	53	24	177	2,533	27	16	...	...	144	3,274
Switzerland, Italy and Austria-Hungary ...	438	14	31	111	...	2,526	...	10	...	...	8	3,138
Greece, Bulgaria, Roumania and Turkey ...	104	41	80	50	5	3,197	...	11	15	424	2,406	6,333
Channel Isles, Gibraltar, Malta and Cyprus...	606	42	83	56	2	1,538	...	6	4	...	17,022	19,359
U.S.A., Philippines and Cuba	36	5	284	187	73	292	...	39	423	...	488	1,827
Canada and Newfoundland	505	754	392	2,811	611	3,597	1,216	335	83	...	14	10,318
British West Indies, British Honduras and British Guiana	405	376	137	90	...	781	...	218	9	45	30	2,091
Mexico and Central America	...	869	8	22	...	207	...	...	...	121	115	1.342
Peru, Uruguay and Bolivia	37	3,665	24	191	20	3,000	...	...	30	129	1,052	8,148
Colombia, Venezuela and Ecuador	...	13	...	12	...	230	...	...	...	8	49	312
Chile	266	17	74	42	47	1,119	...	120	...	264	245	2,194
Brazil	554	598	374	641	175	7,503	2,054	174	164	1,881	54,264	68,382
Argentina	1,378	6,784	597	1,098	872	5,646	315	1,382	375	3,978	1,892	24,317
Egypt, Tunis and Persia	300	232	96	207	138	299	605	297	1	1,146	348	3,669
British West Africa and St. Helena	69	217	59	46	140	8	...	11	...	53	1,818	2,421
Rhodesia, O.R.C. and Transvaal	1,099	1,083	543	685	355	5,109	650	227	127	167	9	10,054
Cape of Good Hope	928	1,512	89	555	77	2,284	18	245	31	60	140	5,939
Natal	1,958	7,340	334	597	137	22,595	12	36	...	29	139	33,177
Zanzibar, Brit. East Africa, Mauritius & Aden	23	74	12	47	...	99	...	4	5	35	43	342
Madeira, Portuguese Africa and India ...	493	467	86	71	...	643	4	4	4	11	340,605	342,388
China and Siam	866	461	99	139	541	1,344	665	291	24	156	114	4,700
Japan	541	11,198	23	140	1,645	15,823	7,533	1,346	...	974	5,415	44,638
India	1,676	17,571	2,504	1,084	1,388	17,127	4.179	1,395	54	161	961	48,100
Ceylon	157	140	179	246	35	216	440	1,022	6	...	9	2,450
Straits Settlements, Fed. Malay States and Sarawak	282	650	264	52	44	2,014	18	140	22	136	1,452	5,074
Hong Kong	464	500	73	437	...	856	51	61	8	34	17	2,501
West Australia	48	66	47	137	140	290	9	313	...	135	2	1,187
South Australia	1,570	51	68	211	49	13,214	89	26	...	210	...	15,488
Victoria	1,825	11,910	93	944	128	1,415	...	377	48	33	7	16,780
New South Wales	2,089	6,922	612	2,312	265	5,183	300	2,971	45	216	847	21,762
Queensland	56	52	140	35	105	1,298	...	...	...	1,209	946	3,841
Tasmania...	...	2	...	4	...	...	...	44	...	16	...	66
New Zealand and Fiji Islands...	1,030	4,544	226	242	65	899	252	245	67	45	107	7,722
Total, £	23,820	80,840	8,975	14,407	8,528	131,351	18,920	11,709	1,560	15,712	435,975	751,797

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Norway, Sweden and Denmark	458	22	...	242	...	2,702	...	383	...	7,801	11,608
Germany	465	11,279	2,697	68,908	69	46,093	3,364	3,243	7,968	33,995	178,081
Holland	...	10	...	2,309	...	140	...	...	18	264	2,741
Belgium	371	1,897	46	126	337	1,394	...	290	418	6,585	11 464
France	9	157	623	3,349	200	1,454	...	1,350	3,472	1,621	12,235
Switzerland	3	450	164	79	53	2,170	...	...	219	...	3,138
Italy	...	6,497	18	...	...	...	...	...	...	3	6,518
Austria-Hungary	...	1,515	32	2,660	...	158	...	35	1,869	292	6,561
United States	5,176	608	888	881	...	7,314	11,472	92	814	694	27,939
Total, £	6,482	22,435	4,468	78,554	659	61,425	14,836	5,393	14,778	51,255	260,285

Additional imports: Canada, goods, £140.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above	2,136	1,654	...	2,258	...	5,553	...	130	1,193	8,402	...

TOTAL EXPORTS: £751,797. TOTAL RE-EXPORTS: £21,326. TOTAL IMPORTS: £260,425.

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

Exports and Imports, 1905-10.—The publication of the December figures of electrical exports and imports completes the returns for 1910, and, as in previous Januaries, we take the opportunity of presenting in concise form, graphically, the outstanding features of these statistics during the past 12 months and preceding years for purposes of comparison. The first set of curves shows the monthly exports, imports and re-exports during the years 1905-10 inclusive. The upper (dot and dash) export curve, from November, 1908, onwards, represents the total electrical exports from this country, being inclusive of telegraphic exports, which were not originally included in the returns. Incidentally, this curve emphasises the fluctating character of the telegraphic export business, which has on three occasions during the past 12 months increased the monthly value of the exports to three-quarters of a million sterling. Apart from this, however, the lower export curve representing general electrical business rather more than maintains the steady rise of the last few years. The influence of the telegraphic exports on the total export values can be gathered from the fact that the monthly returns, *including* telegraphic material, averaged during 1909, £304,000, and, during 1910, £474,000; but, *excluding* telegraphic exports, the corresponding average values were, 1909, £234,000; 1910, £285,000 (the figures being approximate), which, while not so striking as those first given, are, nevertheless, very satisfactory, especially if compared with the meagre £112,000 average obtaining at the commencement of our export curve. The imports, after a comparatively flat year in 1909, when they averaged about £154,000 per month, show a very rapid increase during the latter half of 1910, the average for the year being increased to £189,000 approximately. The re-exports curve also is considerably above the corresponding values for 1909, although, on the whole, rather featureless.

Prominent Exports and Imports, 1907-10.—These curves, figs. 2 and 3, call for little remark. Apart from the telegraphic exports (which are shown in fig. 1), our principal export business is in electrical machinery and cables, in both of which a steady improvement can be traced during 1910.

Turning to the chart showing the three principal imports, the 1910 curves show a total eclipse in value of imported machinery by lamp importations, which reached very high figures during the latter half of 1910, and this despite the continued opening of lamp factories in this country. After being featureless for the last three years, the importation of telegraphic and telephonic material took a sharp upward turn during the latter part of the year, as shown by the dotted curve; machinery imports remained stationary, on the whole, during 1910, although on a higher level than in the preceding year.

Purchasing Countries and Importers into the United Kingdom.—Under this heading we have grouped some of the leading purchasers of British goods, also the most prominent importers of electrical goods into this country. Thus our fourth chart covers two years' exports to prominent American

FIG. 1.—Chart showing monthly electrical exports and imports during the past six years.
The upper export curve is inclusive of telegraphic exports from November, 1908.

FIG. 2.—Monthly exports of electrical machinery and electrical cable other than telegraphic or telephonic cable, during 1907-10 inc.

FIG. 3.—Monthly imports of electrical machinery, telegraphic and telephonic material (inclusive of telephonic and telegraphic cable after November, 1908) and electric lamps and parts, during 1907-10 inc.

FIG. 1.

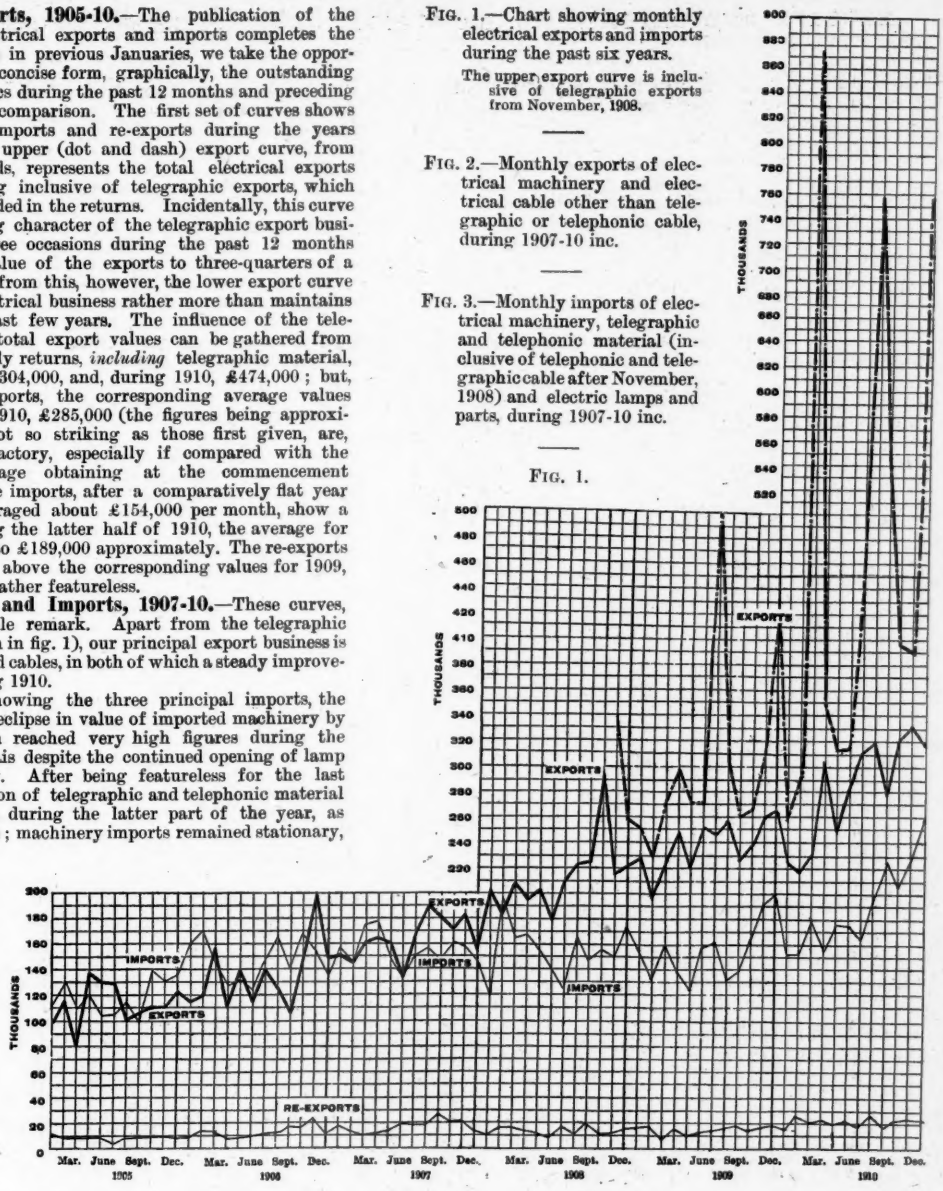


FIG. 2.

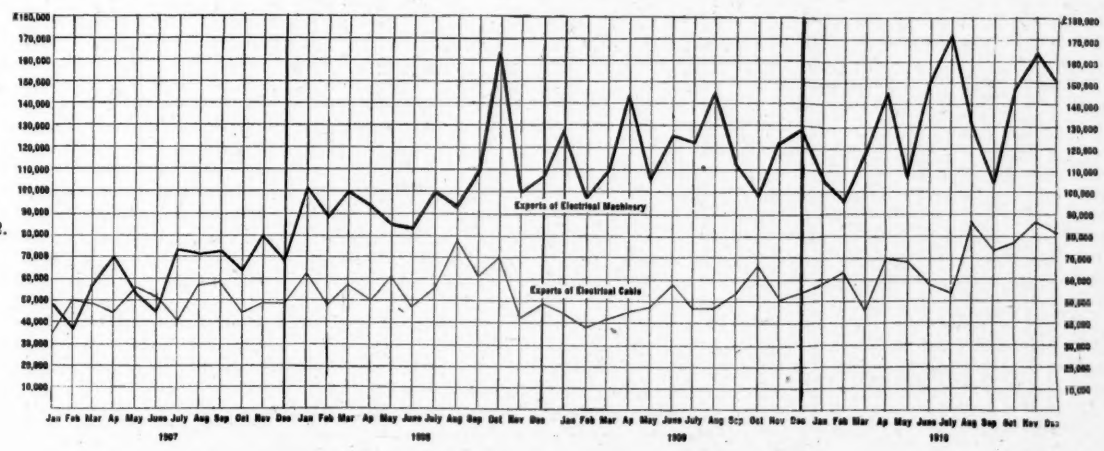
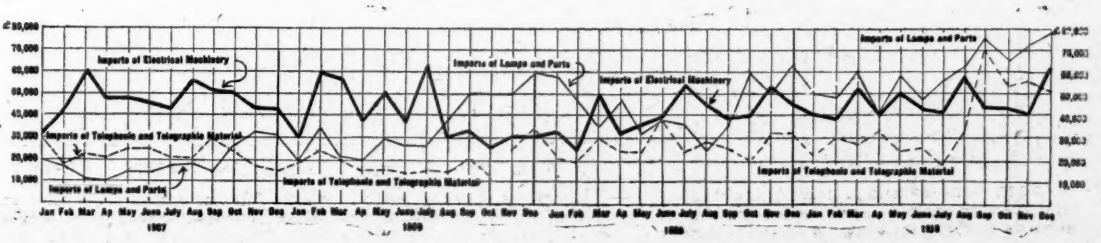


FIG. 3.



markets, viz., Canada (including Newfoundland), Argentina and Brazil. The Canadian market, as a rapidly improving one for British electrical

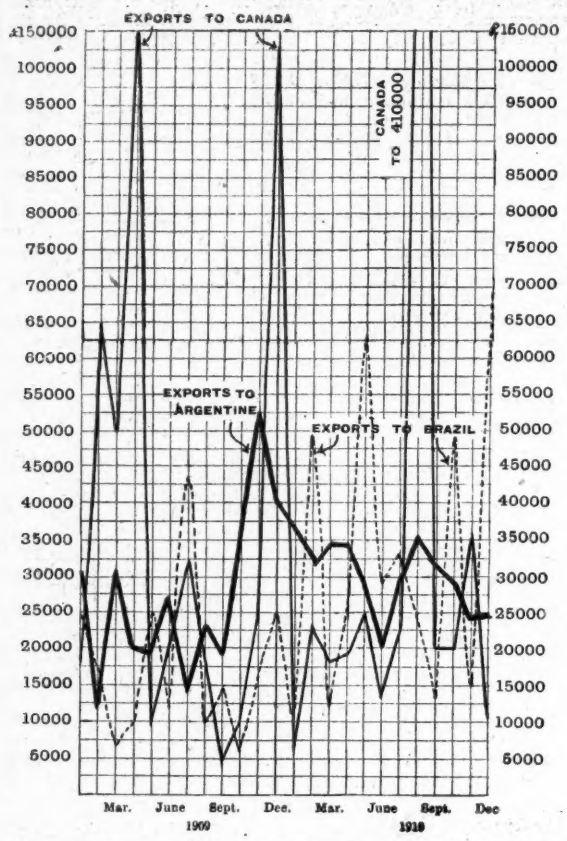


FIG. 4.—EXPORTS TO CANADA, ARGENTINA AND BRAZIL, 1909-10.

goods, has frequently attracted attention; its particular value for general business is to some extent obscured in the chart by the large telegraphic purchases which account for the abnormal peaks

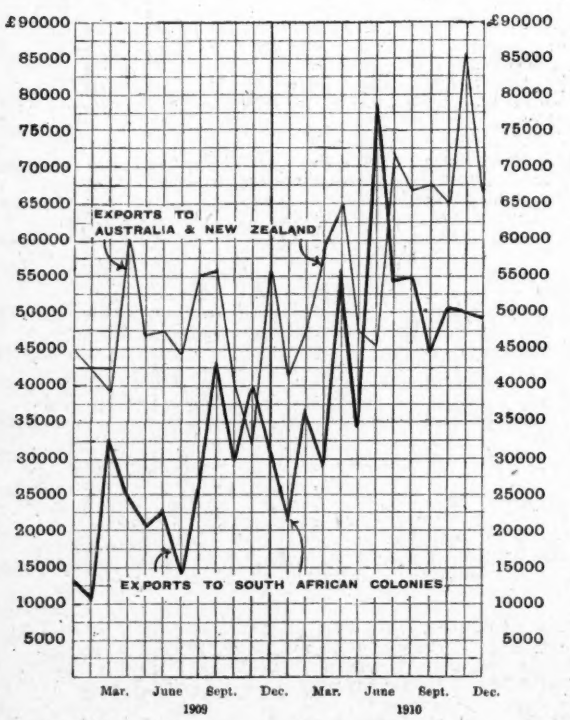


FIG. 5.—EXPORTS TO AUSTRALASIA AND SOUTH AFRICA, 1909-10.

during the two years. Both the Argentine and Brazil do a steadily increasing electrical business with this country.

The fifth chart shows the rapidly increasing value of the South

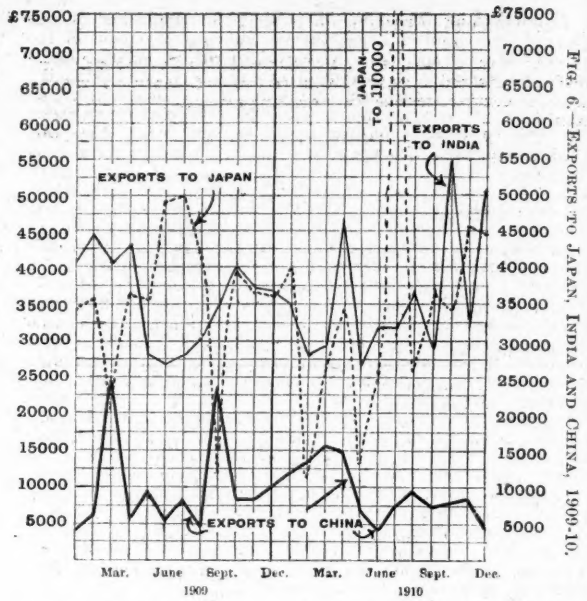


FIG. 6.—EXPORTS TO JAPAN, INDIA AND CHINA, 1909-10.

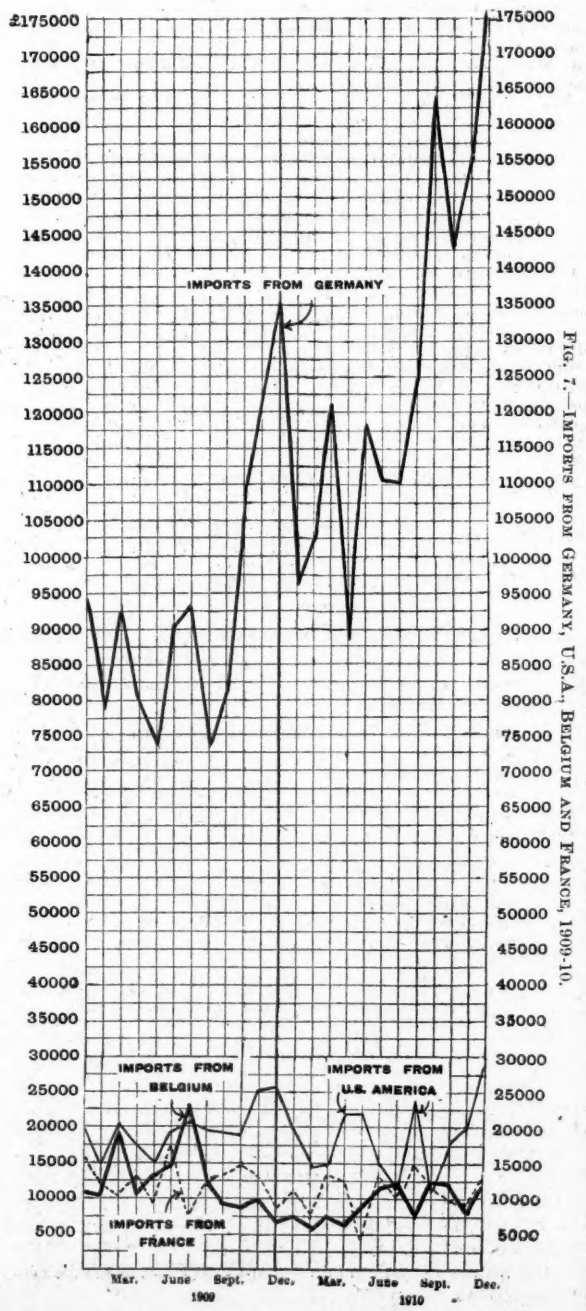


FIG. 7.—IMPORTS FROM GERMANY, U.S.A., BELGIUM AND FRANCE, 1909-10.

African market to our manufactures, the Colonies included being Cape Colony, Natal, Transvaal and Orange River Colony. Much the same may be said of the Australian and New Zealand markets, which, despite the inroads of Continental and American manufacturers, continue to take an increasing amount of British-made material.

The sixth chart deals particularly with India and the Far East; the fluctuating character of our Japanese business is well shown, contrasting with the comparatively steady Indian trade. The lower curve appears to indicate a falling away in our Chinese trade during the past year.

The last chart, dealing with countries importing into the United Kingdom, is in some ways more interesting than the others, showing as it does the tremendous headway which the Germans have made, and continue to make, in their overseas electrical business, particularly as regards this country, and in comparison with their most prominent competitors of a few years ago—viz., U.S.A., France and Belgium. The three last mentioned are doing, if anything, a declining electrical business with this country, taking into account the extensive field of operations which Germany has succeeded in exploiting.

The extensive character of the lamp importations into this country has been referred to; the monthly returns shows that Germany, which originated the metal lamp in its commercial form does from 75 to 80 per cent. of this business; and if the December, 1910, returns may be taken as a criterion, she supplies about 50 per cent. of the cable, 75 per cent. of the machinery, 60 per cent. of the telegraphic and telephonic, and quite half the carbon imports into this country.

The metal lamp business may be regarded as Germany's own, but it certainly redounds to the credit of her people that they are still able to retain such a valuable business in this country in such competitive home products as electrical cables, machinery and telegraphic and telephonic material, and, at the same time, to secure half the carbon imports, while other Continental and American competitors are rather losing ground in this country. One may well ask—How is it? German electrical goods frequently being more costly than home products.

GENERAL.—During the last five years many additional countries have from time to time appeared in our returns as customers, while the list of importers into this country has reached its practical limits.

The character of our export trade has remained practically unchanged during that period, but it is quite otherwise with the Continental and American import business into this country, which, due to increasing productive power at home, has undergone a complete change, as shown by the third chart. Finished products are apparently being replaced by constructive materials—as, for instance, approximately £5,000 worth of insulating material, fibre, cloth, tape, &c., figuring in the December U.S.A. imports. Originally the U.S.A. supplied the bulk of the electrical machinery entering this country, while Sweden and Belgium were responsible for almost all our telephonic purchases; a glance at the recent returns will show the altered state of affairs at the present time.

INDIAN NOTES.

[FROM OUR SPECIAL CORRESPONDENT.]

Kabul.—The Calcutta *Statesman* says that Mr. C. Bonnett has returned from Kabul, where he has obtained for his firm, Messrs. F. and C. Osler, Ltd., a contract for the erection of a hydro-electric plant at Kabul.

Power is to be taken from the Salang River, and electrical energy is to be generated at a pressure of 44,000 volts, and transmitted to the capital, a distance of 40 miles. It will be there transformed down and used for the electric driving of the Amir's gun shops, leather factory, and woollen mills, and also for private and street lighting in Kabul City. This shows that the Amir is following the lead of the other Indian states, where water power is made use of with handsome results financially, notably, Mysore and Cashmere.

In Mysore State it is possible that within a short time a scheme will be sanctioned for electrifying the 75 miles of metre gauge railway between Bangalore and Mysore City. Energy would be taken from Cauvery Falls power station.

Lahore.—The municipality is inviting firms to put forward schemes for the city and cantonment lighting by electricity, a concession is to be granted to the firm whose proposals and conditions are most favourable. Particulars are to be had from the Secretary, Municipal Corporation, Lahore.

King's Coronation, Delhi.—There will probably be good scope at Delhi for electric work in January, 1912, at the Coronation Durbar. Already plans are being drawn up for lighting, drainage and sanitary work. The whole arrangements will probably be under the direction of Sir John Hewitt, who has so ably organised matters in connection with the Allahabad Exhibition.

Electrical Concessions in Turkey.—The December issue of the *Journal of the British Chamber of Commerce of Turkey* states that it has received through the courtesy of his Majesty's Acting-Consul at Jerusalem, translations of the contracts and specifications of the following schemes which the Municipality of Jerusalem propose carrying out. These documents may be seen on applying to the Secretary at Constantinople. The following are, however, the general conditions of the adjudications;—

Tramways.—The concession of the tramways of Jerusalem will be accorded, with no subsidy or guarantee of interest, according to the clauses and stipulations of the contract and specifications hereto annexed. The concessionaire shall undertake the immediate construction and operation of the system indicated by solid blue lines on the map also annexed hereto, and to construct and operate the projected lines indicated on the same map in dotted blue lines, according to the conditions stipulated by the agreement. The length of the lines to be constructed at once is about 15 kilometres 600 metres. That of the lines projected is about 1 kilometre 650 metres. The competition between the bidders shall relate exclusively to:—

1. The formula of the operation of the plan of the contract, of which the coefficients have been left blank, to be filled in at discretion of the bidders.
2. The rates of interest and amortisation to be fixed for the capital of the first establishment, and that of complementary works as well as the sums serving as a base for the division of profits.
3. The term of the concession. (All undetermined clauses are underlined in red in the contract and specifications annexed.)
4. The financial and technical responsibility of the bidders, who shall furnish, with respect to this, all necessary references.

No addition or modification of the above conditions will be taken into consideration.

Electric Lighting.—The concession for the electric lighting of Jerusalem will be given without subsidy or guarantee, and subject to the clauses and conditions of the agreement and the specifications hereto annexed. The competition between the bidders will rest exclusively upon:—

1. The duration of the concession.
2. The maximum sale price of the current for:—(*a*) The municipal lighting; (*b*) public lighting; (*c*) motive force.
3. The number of arc lamps to be furnished and illuminated without charge to the municipality. (The above unknown quantities are underlined in red in the agreement and specifications hereto annexed.)
4. The financial and technical capacity of the bidders, who shall submit for this purpose all necessary references.

N.B.—For information, the City of Jerusalem maintains at the present time 1,000 oil lamps for the public illumination. No addition or modification in the above conditions in the agreement or in the specifications will receive consideration.

Telephones.—The concession for telephone service at Jerusalem, Jaffa and Bethlehem will be granted without subsidy or guarantee according to the stipulations of the contract and specifications hereto annexed:—

The bidding of the contractors shall relate exclusively to:—

1. The term of the concession.
2. The maximum charge for conversations of five minutes (for details see specifications).
3. The charge for annual subscription:—(*a*) In Jerusalem; (*b*) from Jerusalem or Bethlehem to Jaffa; (*c*) from Jerusalem to Bethlehem.
4. The number of gratuitous installations for the municipality:—(*d*) At Jerusalem; (*e*) at Jaffa; (*f*) at Bethlehem.

(The undetermined clauses above are underlined in red in the contract and the specifications annexed.)

5. The financial responsibility and technical reputation of the contractors, who shall furnish all necessary references in this respect.

No addition or modification of the above clauses, either in the contract or specifications, will be taken into consideration.

Public Works.—The Ministry of Public Works invites offers for a concession to be granted for electric tramways for the town of Adana, and for electric power for the Vilayet of Adana, the concessionaire having the right to utilise the waters of the Seihoun Tchai river. Those wishing to tender can obtain all information on application to the Director of Public Works, where the dossier will be on sale for Ltq. ½. Tenders must be sent in before the 1/14 March, 1911.

The Ministry of Public Works also invites offers for the concession to be granted for electric tramways for the town of Adrianople, and for electric power in the Sandjak of Adrianople, the concessionaire having the right to utilise the waters of the rivers Moritza, Arda and Touridja. Anyone wishing to tender may obtain the dossier of this enterprise at the Ministry on payment of half-a-lira. Tenders to be sent in before the 2/15 March, 1911.

The Heddernheim Copper Works.—The directors of the Heddernheim Copper Works and South German Cable Works Co., of Frankfort-on-Maine, propose to increase the share capital by £50,000 to £450,000 for the purpose of maintaining the works at Heddernheim, Gustavsburg and Mannheim on the level of modern technical progress and of further extending them. It is explained that the fresh issue of bonds of £100,000 previously resolved upon was intended for the consolidation of the bank debt.

Austria.—Branch works for the manufacture of accumulators for the Austrian market are about to be established in Vienna by the Hensemberger Accumulator Works Co., of Milan.

ELECTRIC POWER IN PORTLAND CEMENT WORKS.

By W. J. COLES, A.M.I.E.E.

(*Concluded from page* 86.)

Variable Speed.—In the case of cranes and hoists it is usually advantageous and often essential that variable speed control should be available, but the chief instance in which its benefit is felt is when arranging the drives to the kiln and its fans. Where kilns are belt-driven from line shafting some variation in speed is usually, although not always, provided for, as should be the case. This takes the form of installing step pulleys which give two or at the most three distinct and fixed speeds, or else a variable speed gear of the Reeves type, which gives any speed desired between the maximum and minimum. The latter course is preferable, as modern opinion favours an easily controlled gear which is not limited to two or three fixed speeds. The drawbacks, however, to this type are that it is expensive to install, costing in many cases more than a complete motor equipment for the kiln; and, further, the wear and tear is heavy both on the special belt and on the bearings. Where a separate electric motor is used to drive each kiln, the speed can be easily controlled from the attendant's platform.

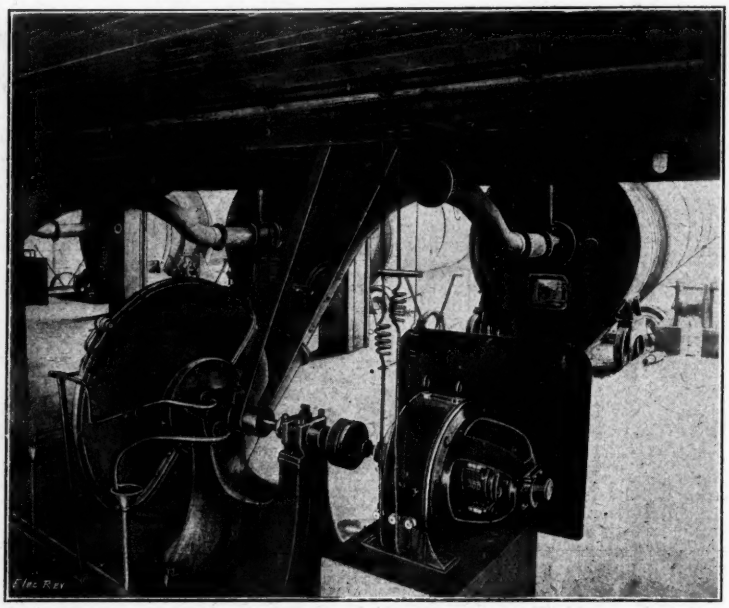


FIG. 3.—MOTOR-DRIVEN FANS FOR SUPPLYING AIR AND COAL TO ROTARY KILNS.

The ability to run the kiln at the exact speed suitable to the conditions prevailing at the moment in the kiln itself means, on the whole year's working, an appreciable increase in the output compared with the case of a kiln having only two or three fixed speeds. The reason is that in the latter case one speed may be too high to produce properly-burnt clinker, while the next one may be too low for the maximum output that can be maintained. In addition, the percentage of fuel used will be increased at the lower output, as the rate of loss of heat by radiation from the kiln is practically constant. The air supply for the kiln, with which the powdered coal is mixed, is usually produced by a fan, but in some cases a jet of steam working on the principle of the injector is used. Where fans are installed it is in the writer's opinion a decided advantage to be able to regulate the supply of air by means of speed control on the fan. This is easily accomplished where each fan has its own motor. It is, of course, possible to regulate the air supply by throttling the suction or discharge end of the fan, but this method is inefficient, and is usually too delicate to entrust to the care of the average kiln attendant. It is a common experience to find that the blast is needlessly left full open, in the absence of convenient speed control, thereby materially lowering the efficiency of the kiln.

Fig. 3 shows the arrangement of motors and fans for supplying air and coal to the kilns at the Hemmoor Works, as installed by Messrs. G. Polysius, of Dessau.

Stoppages and Breakdowns.—As previously mentioned, it is the practice in many works to run the raw material plant only in the daytime, whereas the cement grinding plant is run night and day. In the case of works direct driven by engines, this usually necessitates running a considerable length of idle shafting during the night unless a separate engine is used for the raw material plant or an expensive system of clutches is installed. Where motors are used, this, of course, is not the case. Further, with electric driving, the running of idle shafting during repairs to the various machines (which owing to the nature of the work are heavy) is obviated to a large extent. In addition, the engine load factor can be maintained at a higher level owing to the ease with which the load is distributed to the various engines. This applies more particularly to large works, where three or more engines are installed.

In a modern cement works, the department which it is most essential should be kept continuously running is the one containing the rotary kilns. Involuntary stops in the running of a kiln give rise to three distinct losses, which are due to impaired quality and quantity of output, increased repairs to the lining of the kiln and increased fuel consumption. These losses may be very serious if the stoppages last for more than a few minutes at a time; one of six or seven hours often necessitates relighting the kiln and a large amount of relining owing to the deleterious effect of cooling. From this it will be seen how important it is to keep the kilns in action, and in designing the power plant this should constantly be borne in mind.

It is the usual practice to keep a reserve supply of prepared raw material and powdered coal sufficient to last for from 24 to 36 hours, so that during the stoppage of these departments for repairs the kilns can still be kept running. Similarly, where the works are driven by two or more engines, the latter should be arranged so that the kiln plant can be run from any one of them. Where direct rope or belt driving is installed, this is not always easy of accomplishment without an elaborate system of clutches and shafting, but where the engines supply electric power the difficulties vanish, and so long as one engine is available the kilns can be kept running.

The actual arrangement of the power plant, and the question whether the whole or a portion of the works should be electrically-driven, depend upon local conditions, and no hard and fast rule can be laid down. Where the nature of the site and the proposed method of handling the raw materials, fuel and finished product are such that the engine room can be satisfactorily arranged in close proximity to the cement or raw material mill, it is often convenient to drive one or both of these direct by means of ropes and to install motors for the rest of the plant. There are two methods by which this can be done. The first is to install an engine with both a rope fly-wheel and the rotor of an electric generator mounted on the crankshaft, the generator being rated at possibly one-third the power of the engine. The second way is to fit the engine with a rope fly-wheel only and to drive the generator by means of a portion of the fly-wheel ropes or from a rope wheel fixed on the main line shaft. Two instances with which the writer is familiar will serve to illustrate the salient features of the alternative methods. The first is at the Stern cement works of Messrs. Toepffer Grawitz & Co., near Stettin. The works is an old one, but during the last few years has been equipped with a new rotary kiln and raw material plant. A new power plant has also been installed.

This consists of a 1,200-H.P. condensing engine fitted with a rope wheel and driving the cement mill direct. On the countershaft is a 350-KW. 500-volt D.C. generator, which supplies power for the rotary kilns and the new raw material plant. This latter is situated at some distance from the engine room, and operates on the semi-wet process. A smaller engine drives a second generator, which is of sufficient capacity to supply power for the kiln plant when the main engine is shut down. An instance of the second arrangement is provided at the Drachenberg Cement Works at Weferlingen, Germany. The accompanying diagram (fig. 4), which is self-explanatory, shows the lay out.

It will be seen that the engine room is situated between the cement and raw material mills. The rope wheels driven from the engines are mounted on hollow shafts and can be connected to the main shaft at will. The main generator, which is of 525 K.V.A. capacity, supplies three-phase current at 525 volts and 50 cycles. With the exception of the cement and raw material mills all the machinery, including that for the preliminary crushing of the cement rock, is electrically driven, the generator being of sufficient capacity to allow for extension. The works, which is a modern one, contains three rotary kilns, and forms a good example of the particular method of driving. It operates on the dry system, and was equipped by Messrs. G. Polysius, of Dessau.

The choice of the electrical system to be employed when designing the power plant of a works, depends to some extent on local conditions. Where there is a possibility of a stand-by or auxiliary supply being taken from the local authority the system used by them would, no doubt, be installed. However, given normal conditions, the writer favours a three-phase system with a frequency of 50 and a voltage of from 400 to 600. Its advantages, compared with direct current, consist in decreased cost of plant and cables, stronger mechanical construction of the motors, freedom from commutator and dust troubles, and also high overload

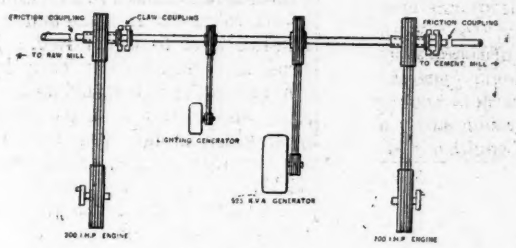


FIG. 4.

capacity and starting torque. Against this is the point that speed control of the motors cannot be obtained as efficiently as with direct current; but as the proportion of variable speed motors, both in number and size, is small compared with the total, this need not be allowed to influence the choice to any great extent, especially as the percentage of time during which they will be running below full speed will not be great. The amount of dust in a cement works even under modern conditions is always considerable, and it is advisable to select a type of motor which is affected as little as possible by this. The enclosing, either of the whole or only of the commutator portion of direct-current motors, considerably decreases the available output, besides rendering the cleaning, inspection, and adjustment of the brushes somewhat difficult, whereas, slip-ring motors can conveniently be fitted with brush-lifting devices, or slip-ring covers, the former course improving the efficiency of the machine. The majority of the machinery in a cement works requires a large starting effort which may amount to from 50 per cent. to 100 per cent. more than the full-load torque. This applies particularly to wash mills, rotaty kilns, ball and tube mills. The ability of the slip-ring induction motor to exert a heavy starting torque without damage to itself, or an excessive demand on the generating plant, is a considerable factor in deciding on the choice of system; by its use, expensive friction clutches which require a large amount of attention are abolished, and the motor can be belted direct on to the machine countershaft. Where plants such as ball and tube mills are driven from line shafting, it is imperative to have friction clutches or elaborate belt shifting devices, the cost of which in many cases approximates to that of the motor. This latter point will be understood when it is seen that with a tube mill normally requiring 90 H.P., it is necessary to install a 140-H.P. clutch in order to obtain satisfactory results. This statement would, no doubt, be disputed by clutch makers, but would be confirmed by the majority of cement works managers, who would be only too glad to dispense with what is generally admitted to be a necessary evil.

With regard to the overload capacity of polyphase motors compared with direct-current ones, this is particularly valuable in the case of rotary kilns and tube mills. Rotary kilns from time to time become distorted, due to unequal cooling when standing and other causes, with the result that on restarting, greater power is required for an hour or two. The interior of tube mills, owing to the practice of watering the clinker and injecting steam into the mill, in order to regulate the setting properties of the cement, becomes to some extent damp, the result being that at times the pebbles and cement have a tendency to adhere and cause the mill to absorb more power.

The cost and consumption of electric energy or fuel per ton of output are of considerable interest both to the owners of cement works and supply authorities who may have a possible consumer in view. Prior to the present rigid specifications for cement and the advent of the rotary kiln, the consumption of energy measured at the engine crankshaft was in the neighbourhood of 60 H.P.-hours—or, say, 45 KW.-hours per ton of cement manufactured for an English works operating on the semi-wet system. This figure has now risen to about 70 to 85 units for a works equipped with rotary kilns. The fuel consumption was about 160 lb. per ton under the old system, and is from 250 to 350 lb. at present.

The load factor has been considerably improved, with the result that 75 per cent. is not an exceptional figure, calculated on the ratio of the units consumed to the product of the average maximum demand and total number of hours in the period under consideration.

This high load factor shows the difficulty a power company or other supply authority is under when endeavouring to demonstrate to a works owner that it will pay him to purchase his energy rather than install his own generating plant. It may, generally speaking, be taken that unless a supply can be obtained on such terms that the price per unit will not exceed from 0·4d. to 0·6d., it will be more economical to generate on the works.

These figures apply only to normal cases where the complete electrification of a works is under consideration, and will need to be modified for very large or small plants, and where an auxilliary or stand-by supply is contemplated. On the other hand, the fact that a works of medium size with an output of, say, 1,000 tons per week may require something like 3½ million units per annum, and will give the supply authority an almost steady and continuous load night and day, including Sundays, is an inducement to quote exceptional terms.

An example of an English cement works entirely driven by electric motors and purchasing power from an outside source is furnished by Messrs. Casebourne's factory at Haverton Hill, near Middlesbrough, which was equipped under the writer's supervision. Three-phase current at 440 volts is supplied by the Cleveland and Durham Electric Power Co. from their sub-station on the works, where it is transformed down from 11,000 volts. The plant, which has an output of 1,000 tons per week and is equipped with four rotary kilns, was originally driven by four Diesel engines belted direct on to the line shafts of the various departments.

Unfortunately, no facilities were provided to enable the kiln plant to be driven by any engine other than its own during necessary stoppages for repairs and overhauling. A total of about 1,100 H.P. in motors of the British Westinghouse Co.'s make has been installed. These vary in size from 200 H.P. downwards. A description of the works was given in the ELECTRICAL REVIEW of May 17th, 1907. In addition to the meters provided to measure the total energy delivered to the company's switchboard, each department has its own meter which is read daily. By this means a complete record is obtained of the power required at each stage of the manufacture per ton of output. The resulting infor-

mation is of considerable value in ascertaining, among other things, the time when such parts as ball mill linings should be renewed, and wash mills cleaned out and the harrow tynes replaced.

In conclusion, the writer would particularly emphasise the importance to electrical engineers of keeping in close touch with developments in the cement industry. The leading firms manufacturing cement machinery look with considerable favour on electric driving, as is evidenced by the large proportion of new works which are wholly or partially equipped on these lines.

ELECTRICITY IN SPOIL REMOVAL.

Most of our readers will be aware that the great shipbuilding firm of Messrs. Sir W. G. Armstrong, Whitworth and Co., Ltd., have recently been making preparations to change the position of their Admiralty shipbuilding plant from Elswick, on the western side of Newcastle-on-Tyne, to Walker, a position to the east of the city and much nearer to the river's mouth. This has been rendered necessary by the increasing size and tonnage of modern battleships, and the increasing difficulty in launching such vessels at the old yard and bringing them down the river past the obstructions in the channel caused by the high-level and swing bridges. The new yards, when completed, will probably form the most important shipbuilding equipment in Europe. In order, however, to prepare the ground for the projected berths and buildings, it has been necessary to reduce the level of the surface by clearing away huge ballast hills composed partly of stiff, heavy clay and partly of iron slag, left there by a former foundry and engineering industry carried on by the firm of Messrs. Bell Bros. The contract was given to Messrs. Nuttall, of Manchester, and the work of excavating and removing the spoil is now in full swing. Steam navvies are at work, and the skips when loaded are conveyed over a very considerable length of full-gauge temporary lines to a loading equipment which deposits the spoil in drop-bottom barges, by which it is carried out to sea and dumped.

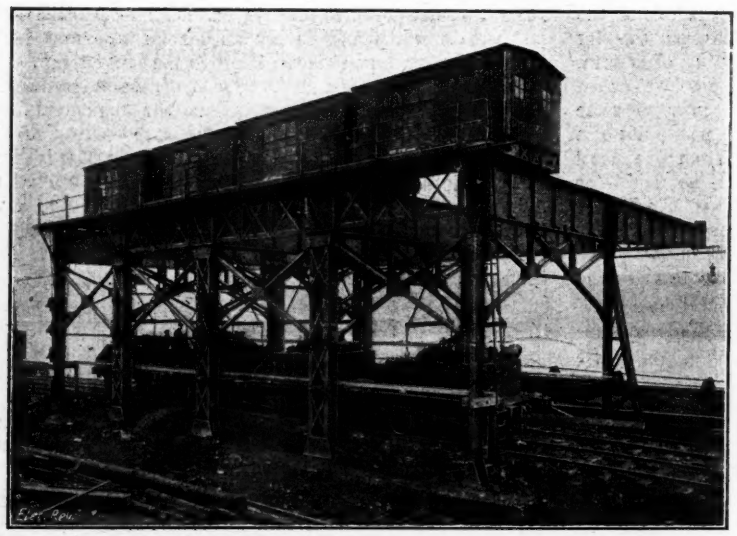


Fig. 1.—Royce Electric Cranes on Tyneside.

The portion of the equipment which is of more particular interest to electrical readers is the battery of electric travelling cranes (fig. 1) which have been built by Messrs. Royce, Ltd., of Trafford Park, Manchester, to the requirements of Messrs. Nuttall, and erected on the river bank in order to transfer the contents of the skips from the railway trucks to the barges. These cranes are four in number, ranged side by side, so as to span two lines of railway track, a third line of rail passing outside the bases of the cranes to enable trucks to be run under each crane as required.

The girders carrying the gantry rails are supported on vertical pillars of sectional steel, braced both longitudinally and laterally in such a manner that a clear way is left for locomotives to pass under the gantry on either of the two lines of rails. The girders are arranged on these columns to form a cantilever, whose outer end projects 30 ft. beyond the edge of the jetty (see fig. 2). The overall length of the track on the gantry rails is approximately 60 ft., of which about half projects over the water. The distance between centres of the four cranes is 18 ft.; the gauge of the gantry rails is 16 ft., while the height from ground level to the gantry rails is 25 ft. At low water the bottom of the 1,000-ton drop-bottom barges used in this work is about 37 ft. below the gantry rails. Spring buffers are provided at each end of the rails to prevent shock due to any accidental over-running of the crab in either direction, and platforms are provided at the base of the cranes on either side of the railway lines, to allow the workmen to operate the skips as they are brought to and from the cranes.

On each pair of gantry rails travels a two-barrel built-up steel crane, of a normal lifting capacity of 15 tons. This, with the motors and controllers to operate it, is housed in an adequately lighted cabin 10 ft. wide and 10 ft. from rail level to top of roof. Each barrel is worked independently by its own motor through machine-cut steel gears, and carries a non-swivelling hook, which in its turn carries suspending attachments, which can be quickly and easily hooked on to projections provided on the steel skips.

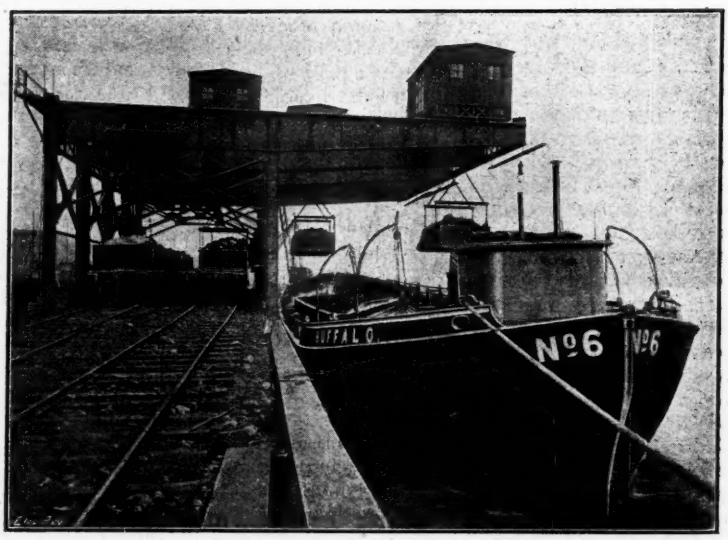


Fig. 2.—Loading Spoil into a Barge.

These have a flush capacity of 9 cb. yards, and are specially strengthened to carry weights considerably in excess of the level capacity of the skip. This will be seen to be necessary when it is remembered that, while the bulk of the spoil to be removed consists of heavy boulder clay, a considerable

amount of iron slag, blasted out in large lumps, has to be carried away by the same means. The skips are so designed as to facilitate tipping by the process of lowering the front end of the skip, by rotating the barrel attached to it, while, in order to negotiate the heavier lumps, which it would be dangerous to drop into an empty barge from a height, the crabs are capable of hoisting or lowering their load through over 37 ft.

The method of operating the gear is, briefly, as follows: The train of loaded skips is shunted beneath the cranes; the men on the platform attach the suspending hooks to the skip, and it is then raised a sufficient height to clear the lateral bracing of the supports. The crab is then traversed till the skip is over one of two positions corresponding to the port or starboard dumping section of the hopper. In the case of small material, the spoil is then dumped by holding the hinder barrel and lowering the front end quickly. In the case of heavy material, the whole skip is lowered to within a safe distance of the barge and then dumped. The operations are then reversed and the skip is returned as quickly as possible to its position over one of the two lines of rails, when it is lowered into its truck and shunted away.

The speed of these operations, of course, depends very largely on the quickness of the crane operators, loaders and shunters, but even in the early days of the installation it was demonstrated that the plant was capable of fulfilling its duty of loading a 1,000-ton barge in an hour. The hoisting speed attained exceeded 25 ft. per minute, the lowering speed being, of course, in excess of this, while the travelling speed reaches 168 ft. per minute. With such a performance, there is no reason to doubt the fact that the contractors for the removal of the spoil are abundantly satisfied with the operations of the cranes.

Some details regarding the electrical equipment of this installation may be of interest. The supply of power is obtained from the mains of the Newcastle-upon-Tyne Electric Supply Co., Ltd., as three-phase current at 440 volts and 40 cycles per second. On each crane are installed three motors of the reversible slip-ring type. On each of the hoisting barrels is a 25-B.H.P. motor, while for the travel a 10-B.H.P. motor is installed. Each motor has its own controller, so that the three motions can be operated independently by the single attendant on each crane. Each barrel is provided with an over-winding circuit-breaker attachment, while each crab is fitted with an automatic travelling brake of the solenoid type which, with the spring buffers above-mentioned, prevents any risk of over travel and enables the operator to bring his crane to the proper leading marks with ease and accuracy. The whole equipment, both electrical and mechanical, reflects great credit on Messrs. Royce, who have in this equipment developed an entirely special design to deal with the particular requirements of the case.

THE EARTHING OF EXTRA-HIGH-TENSION TRANSMISSION SYSTEMS.

BY W. MEGGAT DEMPSTER, B.Sc. ENG. (LOND.).

CERTAIN of the advantages of earthing the neutral of low-tension three-wire D.C. and four-wire A.C. systems do not appear to be realised on extra-high-tension systems.

One important advantage resulting from the earthing of the neutral is the division of pressure and the limiting of the insulation pressure in consequence to one-half, in the D.C. case, and to 1/1·73, in the A.C. case, of the maximum pressure of the system.

On low-tension supply networks the earth connection is generally through a circuit breaker or fuse, with indicator lamps attached to show if the neutral is earthed or isolated. The existence of the lamps shows that the earth connection is not intended to be of an absolutely permanent nature, and it may become interrupted by an outer or phase fault. When this happens, the insulation on certain parts of a system has to withstand increased pressure, and if this boosting up of the insulation pressure resulted in considerable damage being done, flexible neutral earth connections would be discarded.

At present there exists a considerable diversity of opinion as to the relative merits of star and delta connections for extra-high-tension transmission networks.

In star-connected systems the neutral is generally permanently earthed, and when a phase goes to earth it means the isolation of the faulty section. If, under these fault

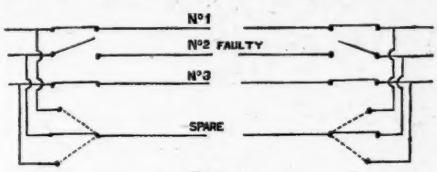


FIG. 1.

conditions, the neutral were disconnected, as in low-tension systems, the insulation pressure would be greatly increased, but there would be no interruption of supply. There exists, however, considerable doubt as to the advisability of following low-tension practice in such cases.

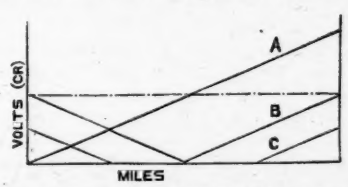
The writer has in mind a rather interesting illustration of what can sometimes occur. A coal mine was served by a T off double aerial line from a switch house on an E.H.T. ring main. At the busiest period of the day one of the lines broke down. When No. 1 line failed, No. 2 line, which generally remained idle and consequently out of trim, was put into use, but it failed almost at once. The result was that the supply to the coal mine was interrupted. If it had been allowable to switch the faulty phase to earth and isolate the star point, the consumers could have been kept on for an hour or so until they had got well through their work. This practice, however, was not permitted, as it was feared that the increased pressure would damage the insulation of the system and find out the weak points.

On examining the lines it was found that one phase on each had broken down; thus out of six wires there were four that were sound, and by selection switching the faulty phases could have been ascertained. Had there been short lengths of flexible cable to hand, fitted with suitable clamps, a sound wire from No. 2 line could have been pooled to No. 1 line in place of the faulty wire and the supply established.

From this it would seem advantageous to employ a spare wire to replace any one that has broken down (fig. 1). This might afford as great a security as a double line of six wires.

With the star method of connection the insulation is only required to withstand the star pressure, *i.e.*, 58 per cent. of the line voltage.

When the delta method is employed, the system is generally isolated. In the case of three-phase traction systems, one



A, Earthed at end only; B, Earthed at middle only; C, Earthed at two points on cross-country route.

FIG. 2.—C.R. DROP ON EARTHED PHASE.

phase is at earth potential and the insulation is concentrated on the other two phases.

The amount of insulation required by an earthed delta system would be very little more than that required by an earthed star system, the line voltages being the same; but a star system is liable to fail in six ways, whereas a delta system may fail in three ways only, and the number of ways in which a system can fail may be taken as some measure of its vulnerability.

If the earthed delta-connected system were employed for transmission purposes, the earthed phase wire could have its insulation graduated to withstand C.R. drop only.

In the case of an aerial line the earthed phase would simultaneously act as an earthed wire protecting the line from lightning discharge.

NEW PATENTS APPLIED FOR, 1911.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

559. "Electricity motor meters of the mercury type." Compagnie pour la Fabrication des Compteurs et Materiel d'Usines a Gaz. (Addition to 90,297/10). January 9th. (Complete.)

548. "Safety support for electric overhead wires." G. Gottschalk. January 9th.

580. "Apparatus for electroplating." M. Reid. January 9th. (Complete.)

585. "Bayonet cap and socket connections of incandescent electric lamps." C. G. M. Bennett. January 9th.

594. "Electric motors and pumps." Gwynnes, Ltd., and J. F. Breeze. January 9th.

607. "Electric arc lamps." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) January 9th.

612. "Electric contact for doors." E. Browne. January 10th.

655. "Electro-galvanising." S. O. Cowper-Coles. January 10th.

672. "Electrical metallurgical furnaces." V. Stobie. January 10th. (Complete.)

673. "Electric metallurgical furnaces." V. Stobie. January 10th. (Complete.)

674. "Electric metallurgical furnaces." V. Stobie. January 10th. (Complete.)

680. "Electrical apparatus adapted for use in mines and the like." Sandycroft Foundry Co., Ltd., and T. M. Dutton. January 10th.

683. "Apparatus for heating air or other media by means of electricity." G. G. Bell. January 10th.

684. "Apparatus for cooking or for carrying out like operations by means of electricity." G. G. Bell. January 10th.

686. "Manufacture of filaments for electric incandescent lamps." H. W. Edmundson. January 10th.

709. "Dynamo connection." H. Leitner. January 10th.

710. "Arc lamp electrodes." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) January 10th.

711. "Electric transformers." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) January 10th.

721. "Electro-deposition of metals." W. Barron and C. A. Barron. January 11th.

731. "Methods of clearing faults in alternating-current high-tension systems." A. M. Taylor. January 11th.

738. "Gas pendants and electroliers." J. J. Pasley. January 11th.

741. "Arc lamps." H. E. Moul. (M. Korting, Germany.) January 11th. (Complete.)

744. "Joints or couplings for piping and electric cable." T. J. Carr. January 11th. (Complete.)

749. "Shade supporter for electrical lampholders." G. M. Williams. January 11th.

774. "Electric supervision of railway points." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) January 11th. (Complete.)

790. "Means for ascertaining the position of the timer or current distributor in electromagnetic ignition devices for explosion engines." W. Sauerbrey. (Convention date, January 12th, 1910, Germany.) January 11th. (Complete.)

791. "Electromagnetic devices for notifying and recording the passing of signals at danger." W. P. Thompson. (Société Cousin et Cie, France.) January 11th. (Complete.)

795. "Electromagnetic flux friction clutch." J. G. Balsillie. January 11th.

805. "Electric current conducting joints, more particularly applicable to incandescent electric lamps." British Thomson-Houston Co., Ltd. (Weintraub, United States.) January 11th. (Complete.)

847. "Plug-and-socket connections for electric light and power purposes." A. P. Lundberg, G. C. Lundberg and P. A. Lundberg. January 12th. (Complete.)

905. "Manufacture of electric accumulator electrodes and means for use therein." R. Pape. January 12th.

906. "Electric storage cells or batteries." R. Pape. January 12th. (Complete.)

933. "Means of control for petrol-electric vehicles." W. A. Stevens. January 13th.

941. "Electrical method of obtaining variable torque and speed between a driving and a driven shaft especially suitable for motor vehicles and the like." P. L. R. Fraser. January 13th.

950. "Shade carriers for electric, gas or other lamps." Siemens Bros. Dynamo Works, Ltd., and E. C. Laughton. January 13th. (Complete.)

956. "Transmission of sound by electrical means." S. G. Brown. January 13th.

996. "Electric lighting plant for railway trains." J. Pintsch Akt-Ges. Convention date January 17th, 1910, Germany.) January 13th. (Complete.)

1,018. "Electric accumulators." K. R. Smith. January 14th.

1,028. "Ignition plugs for internal combustion engines." T. G. Smith and F. J. Platt. January 14th.

1,036. "Electrostatic or influence machines." E. A. Watson and Morris and Lister, Ltd. January 14th.

1,037. "Electrical switches." A. W. Penrose. January 14th. (Complete.)

1,048. "Automatic electrical signalling apparatus for railways." Automatic Electric Block Signalling Co., Ltd., and R. P. Brousson. January 14th.

1,056. "Electricity meters." H. Landis and K. H. Gyr. January 14th. (Complete.)

1,058. "Electric circuit-controlling devices." British Thomson-Houston Co. (General Electric Co., United States.) January 14th.

1,059. "Selenium photometer." E. Presser. January 14th.

1,074. "Electrical heating apparatus." A. F. Berry. January 14th.

Robertson's Dance.—About 300 were present at the fancy dress dance of Robertson's Electric Lamps, Ltd., on Saturday, January 14th. The prizes were presented by Mrs. C. Wilson, the winning costumes being (in order of declared merit):—Prince (Beggar-maid and Prince), Early Victorian, Scotch Lass, Mrs. John Bull, and Spanish Girl.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1909.

Dynamo-Electric Machinery. Bruce Peebles & Co. and P. D. de la Cour. 24,187. October 21st. (Cognate application, No. 29,312 of 1909.)

Switches for use in Electric Circuits. R. Broadbent. 29,399. December 15th.

Conduits or Casings for Electric Conductors. Key Engineering Co. and L. Nagel. 29,850. December 30th.

Electrical Heating Apparatus. S. L. R. Price. 29,411. December 30th.

Separators of Electrodes in Galvanic Batteries. H. F. Joel. 29,511. December 16th.

Electrical and Automatic Control of Engines. L. Sunderland and G. C. Pillinger. 29,944. December 22nd.

Automatic Telephone Systems. American Automatic Telephone Co. and C. L. Goodrum. 29,963. December 22nd.

Dynamo-Electric Machines. M. Walker. 30,482. December 30th.

1910.

Arrangement for Indicating the Existence of a Current in the Leads of Electrical Ignition Devices. Firm of Robert Bosch. 28,049. October 5th. (Date applied for under International Convention, June 2nd, 1910.)

Devices for Automatically Adjusting the Period of Ignition in Internal-Combustion Engines. Firm of Robert Bosch. 24,687. October 24th. (Date applied for under International Convention, October 10th, 1910.)

Apparatus for the Manufacture of Incandescent Electric Lamps. A. S. Knight. 24,810. October 25th. (Date applied for under International Convention, November 3rd, 1909.)

System of Telegraphy. R. Wood. 1,287. January 18th.

Electric Motor Controlling Devices. Adams Manufacturing Co. (Cutler-Hammer Manufacturing Co.) 4,794. February 25th.

Electric Clocks. H. B. Swift and W. D. Baxter. 4,936. February 28th.

Locking Device for Electric Lamp Holders. H. Brooker and W. A. Hooper. 6,133. March 11th.

Electrically-Operated Signalling for Railways or Tramways. W. R. Sykes Interlocking Signal Co, J. Boot and R. W. Tarrant. 6,743. March 17th.

Insulators for High-Tension Transmission Systems. British Thomson-Houston Co. (General Electric Co.) 7,212. March 22nd.

Electroplating Barrel Apparatus. T. A. Smith and T. Deakin. 7,226. March 23rd.

Apparatus for Electrical Driving of Roundabout and other Cars Running on a Fixed Coupse. W. J. Affleck and J. Pilling. 9,538. April 20th.

Sparking Plugs. E. Kühn. 19,133. May 24th.

Device for Leading Current to the Sparking Plugs of Combustion Engines. Soc. Industrielle de Delle. 12,593. May 24th. (Date applied for under International Convention, June 3rd, 1909.)

Central Energy Electrical Signalling System. S. Goldstein. 16,332. July 8th.

Apparatus for Producing Electrical Impulse Charges for Wireless Telegraphy and Telephony. S. Eisenstein. 16,364. July 8th. (Application for Patent of Addition to No. 10 019 of 1908.)

System of Control and Apparatus for Indicating Electric Calls. N. Viette. 18,778. August 9th. (Date applied for under International Convention, October 19th, 1909.)

Portable Electrical Firing Instrument. W. Aitken and British Insulated and Helsby Cables, Ltd. 19,659. August 23rd.

Electromagnets with Removable Cores. Siemens Bros. & Co. (Siemens and Halske Akt.-Ges.) 19,971. August 25th.

Commutation of the Rotor Currents in Polyphase Electric Commutator Machines. Siemens Bros. Dynamo Works. (Siemens-Schuckertwerke Ges.) 23,633. October 12th.

Electromagnetic Winding Apparatus for Clocks or other Mechanism. A. J. Boult. (Normal Zeit Ges.) 23,773. October 13th.

Portable Electric Lamps. Electric Export Werke Ges. and E. Gottschalk. 28,079. December 2nd. (Date applied for under Rule 13, December 20th, 1909.)

Admiralty Electricians.—The Admiralty has notified the Devonport authorities in a circular letter that warrant electricians will be given acting appointments on advancement. On the expiration of one year's service, they will be eligible for confirmation, provided their conduct and qualifications have been found satisfactory. In connection with the establishment of warrant rank for the electrician branch, it has been decided that the service qualification for the advancement of electricians to the rating of chief electrician, second class, shall be assimilated to that in force for engine-room artificers, viz., six years' service, of which three years must have been actually afloat. The rosters of candidates for promotion to commissioned electrician, warrant electrician, will be kept in H.M.S. *Vernon*. The rates of pay will be as follows: Commissioned electrician—On promotion, 11s. 6d. a day; after two years' service, 12s. a day; after four years' service, 12s. 6d. a day; after six years' service, 13s. a day; after eight years' service, 13s. 6d. a day. Warrant electrician—On promotion, 8s. 6d.; after five years' service, 9s. 6d.; after 10 years' service, 10s. 6d. To be eligible for examination for warrant electrician, a candidate must have completed the qualifying service for advancement and produce certificates (*a*) from the captain of the torpedo school at the port to which he belongs, that he is recommended for advancement. This recommendation will be based on the marks obtained by the candidate in his previous examination in the torpedo-school, and his general ability as a workman; (*b*) from the captain of the ship in which he is serving, that he is considered fit in every respect for advancement to warrant rank.